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The World Bank

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Report No. 7041

PROJECT COMPLETION REPORT

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

December 8, 1987

Asia Regional Office

CURRENCY EQUIVALENTS

Currency Unit	=	Won (W)
US$1.00	=	W 890
W 1,000	=	US$1.1

WEIGHTS AND MEASURES

Metric System

ABBREVIATIONS

ADC	Agricultural Development Corporation (Executing Agency)
EPB	Economic Planning Board
ERR	Economic Rate of Return
FAO/CP	Food and Agriculture Organization/World Bank Cooperative Program
FLIA	Farmland Improvement Association
HNG	Heung Nong Gye
GOK	Government of Korea
HYV	High-Yielding Variety (of Rice)
IBRD	International Bank for Reconstruction and Development (World Bank)
ISWACO	Industrial Sites and Water Resources Development Corporation
MAF	Ministry of Agriculture and Fisheries
MOC	Ministry of Construction
NACF	National Agricultural Cooperative Federation
OED	Operations Evaluation Department
ORD	Office of Rural Development
PCR	Project Completion Report
SAR	Staff Appraisal Report
TRV	Traditional Variety (of Rice)

FISCAL YEAR OF BORROWER

Government of Korea : January 1 to December 31

THE WORLD BANK
Washington, D.C. 20433
U.S.A.

Office of Director-General
Operations Evaluation

December 8, 1987

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Completion Report on Korea Ogseo Area Development Project Phase I (Loan 1503-KO)

Attached, for information, is a copy of the report entitled "Project Completion Report : Korea Ogseo Area Development Project Phase I (Loan 1503-KO)" prepared by the FAO/World Bank Cooperative Programme for the Borrower. No further evaluation of this project by the Operations Evaluation Department has been made.

Attachment

PROJECT COMPLETION REPORT

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

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(LOAN 1503-KO)

PREFACE

This is the Project Completion Report (PCR) of the Ogseo Area Development Project Stage I for which Loan 1503-KO was approved on December 22, 1977 in the amount of US$36.0 million. The loan was closed fully disbursed on June 30, 1985, two years behind schedule, although project works were not expected to be completed before the end of 1988.

The PCR, prepared by FAO/CP, is based upon a review of the Staff Appraisal Report (SAR No. 1728-KO, dated December 1, 1977); the President's Report (No. P-2183-KO, dated December 7, 1977); the Loan and Guarantee Agreements of January 4, 1978; project data compiled by ADC; supervision reports and various project-related Bank files. Field visits to the project area were made in September 1985 and May 1986; discussions were held with project staff in ADC and the staff of local offices of the Office of Rural Development, National Agricultural Cooperative Federation and Nonsan Farmland Improvement Association, and Bank staff who have been associated with the project.

The report was not selected for audit by OED, as its more important findings and lessons are similar to those noted in the combined PCRs of the Miho Watershed Area Development and Yong San Gang Irrigation Stage II Projects (OED Report No. 6197 dated May 21, 1986) as well as the PPAR of the Korea Rural Infrastructure Project II (OED Report No. 6197 of June 6, 1986).

The draft report was sent to the Borrower for comments on September 17, 1987. Comments received are attached to the PCR as an annex.

The assistance provided during the preparation of this report by the Government of Korea and the staff of ADC is gratefully acknowledged.

PROJECT COMPLETION REPORT

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

BASIC DATA SHEET

KEY PROJECT DATA

	Appraisal Expectation	Actual or Current Estimate	Actual as % of Appraisal
Project Cost (US$ million)	76.8	102.6 /a	136
Loan Amount (US$ million)	26.8	26.8	100
Date Physical Components Completed	06/30/82	12/31/86	144
Economic Rate of Return (%)	12.8	16.8	88
Financial Performance	Satisfactory	Satisfactory	
Institutional Performance	Adequate	Excellent	

CUMULATIVE ESTIMATED AND ACTUAL DISBURSEMENTS (US$ Million)

	1979	1980	1981	1982	1983	1984	1985	1986
Appraisal Estimate	1.8	7.80	20.2	20.9	26.80	26.8	26.80	26.8
Actual	—	0.65	5.2	16.9	18.87	25.5	33.90	36.8
Actual as % of Est.	—	8	26	80	68	71	94	100
Date of Final Disbursement	12/26/85							

MISSION DATA

	Month/ Year	No. of Persons	Days in Field	Specializations Represented	Performance Rating Status /b	Trend /c	Type of Problems /d
Ident.Prep. /e	1974/76						
Appraisal	08/77	3	52	b,a,e			
Supervision I	08/78	2	20	b,e	2	2	F
Supervision II	07/80	2	28	e,e	3	3	F
Supervision III	08/81	1	14	e	2	1	F
Supervision IV	11-12/81	3	66	e,a,p	2	1	F
Supervision V	07/82	1	12	e	2	1	F
Supervision VI	08/83	3	60	a,a,p	2	2	F
Supervision VII	06-07/84	3	60	e,p,b	2	2	F
Subtotal			308 /f				
Completion (FAO/CP)	08/86	3	28	b,a,e			
Total			336				

a/ Includes costs of US$73 million incurred up to 08/30/85 (closing date) and estimated costs of US$30 million to complete project by end 1988.

b/ 1 = problem free or minor problems; 2 = moderate problems; 3 = major problems.

c/ 1 = improving; 2 = stationary; 3 = deteriorating.

d/ F = financial.

e/ The project was prepared during 1974-76 by ADC with the assistance of consultants and periodically assisted by the Bank.

f/ Mandays in field include time spent on supervising other projects.

STAFF INPUTS (by fiscal year)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Total
Preparation	1.4	19.3	8.2	10.2	5.4	1.5	-	-	-	-	-	-	-	-	41.1
Appraisal	-	-	-	-	19.0	23.3	-	-	-	-	-	-	-	-	42.3
Negotiations	-	-	-	-	-	8.0	-	-	-	-	-	-	-	-	8.0
Supervision	-	-	-	-	-	2.6	0.9	3.1	4.5	1.9	1.8	1.1	0.5	15.1	31.4
Other	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	1.1

OTHER PROJECT DATA

Appraisal: June 1977 /8 Board Approval: December 22, 1977
Negotiations: November 7-15, 1977 Effectiveness Date: March 29, 1978
Agreement Date: January 4, 1978
Closing Date: Original: 06/30/83 Revision: 06/30/84 Actual: 06/30/85
Executing Agency: Agricultural Development Corporation (ADC)

Name of Currency: Won (W)
Appraisal Year Average: US$1.00 = W 484
Intervening Years Average: US$1.00 = W 680
1986 Average (to April 1986): US$1.00 = W 890

Borrower: Agricultural Development Corporation (ADC) with the guarantee of the Government of the Republic of Korea

8/ Prefeasibility study, "Comprehensive Watershed Development--the Ogseo Agricultural Development Project", October 1972 by the Ministry of Agriculture and Forestry and ADC.

PROJECT COMPLETION REPORT

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I (LOAN 1503-KO)

EVALUATION SUMMARY

Introduction

The project was the seventh in a series of projects to assist the country's land and water development. These projects have been an important part of Government's strategy to raise rural incomes, to create productive rural employment, discouraging migration to cities, and to satisfy the country's demand for foodgrains, particularly rice and barley.

Objectives

The project was the first phase of a large master plan aimed at developing the lower Geum, Mangyeong and Dongjin river basins covering a total area of about 102,000 ha. The project was to benefit some 23,400 farm families, providing irrigation, drainage and land development on 12,290 ha, including 7,090 ha of new and 3,710 ha of improved irrigation and drainage, and providing 1,490 ha with a more assured water supply. The project was to be implemented in five years (1978-82) by the Agricultural Development Corporation (ADC) for an estimated cost of US$76.0 million.

Implementation Experience

Little progress was made in the first six months after loan effectiveness, and it was not until November 1979 that the contracts for the first three irrigation sub-projects were awarded. During this period, ADC did a study of pumping alternatives which resulted in appreciable changes to the pumping arrangements. Work on the first three sub-projects was completed in December 1983, having taken about four years instead of the two and a half forecast in the SAR. Construction periods for the other sub-projects, which are not yet completed, are expected to be of about the same duration. The delays were mainly due to late preparation of final design and Government's difficulties in providing adequate budget allocations to ADC due to rapid inflation. In addition, self-sufficiency in cereals had been attained in 1982, resulting in lower priority being given by Government to irrigation projects. However, ADC's performance in constructing project works was of high standard. When the loan was closed, in June 1985, total project was estimated at US$103 million (including US$30 million to complete the project by end 1988), or a cost overrun of 36% and a time overrun of 144%.

Results

Irrigated area yields and cropping intensity have increased significantly, resulting in higher production of rice and barley. New crops,mostly vegetables, have been introduced in the project area. As in other irrigation projects in Korea, use of high-yield varieties of rice has been less than expected because of consumer preference for traditional rice.

Based on the cropping pattern and yields of the complete sub-projects, the overall project ERR is now estimated at 10%, compared with an appraisal estimate of 12%. The main factors contributing to the lower ERR are implementation delays and higher investment costs than anticipated.

Sustainability

The sustainability of economic benefits is somewhat doubtful as project works were not fully completed at project closing and price forecasts for rice are now lower than estimated at that time. On the positive side, the financial price of rice remains attractive for producers, who are also strongly committed to pay adequate water charges and to ensure operation and maintenance of the project works.

Findings and Lessons

The main lessons learned from this project are as follows:

(a) In order to avoid implementation delays specific commitment should be obtained from Government in the Guarantee Agreement to allocate the necessary funds;

(b) To better compete with traditional rice varieties more research should be directed to producing HYVs which meet consumer preferences;

(c) Revision of farm size ceilings is essential to prevent smallholdings from becoming 'nominal' assets which no longer produce high enough incomes to prevent the loss of young people to the cities;

(d) The reliability of water supply as well as the level of prices received by farmers for the main crops grown influence strongly the rate of irrigation cost recovery by a governmental agency providing operation and maintenance services; and

(e) Continuity of a technically strong Bank supervision team is a definite advantage to project success.

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I

LOAN 1503-KO

PROJECT COMPLETION REPORT

September 9, 1986

Projects Department
East Asia and Pacific Regional Office

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

PROJECT COMPLETION REPORT

I. INTRODUCTION

1.1 The Ogseo Area Development Project Stage I (Ogseo Project) was the Bank's seventh lending operation in Korea to assist the country's land and water development. The Bank has been involved in this sub-sector since 1969 when it approved a loan of US$45 M for Pyongtaek-Kumgang Irrigation Project (Loan 600-KO), followed by six other projects including Ogseo Project (see Table 1). These projects have formed an important part of the Government's strategy to raise rural incomes, to create productive rural employment (thereby discouraging migration to the cities), and to satisfy the country's demand for foodgrains, particularly rice and barley.

1.2 The Ogseo Project, the subject of this completion report, was estimated to cost US$76 M of which US$36 M, representing the foreign exchange component, was financed by a Bank loan. The project, which was to benefit some 23,400 farm families, was designed to provide irrigation, drainage and land development, on 12,290 ha which included 7,090 ha of new and 3,710 ha of improved irrigation and drainage, and 1,490 ha with a more assured water supply. Responsibility for implementation rested with the Agricultural Development Corporation (ADC).

1.3 This report is based on a review of the Staff Appraisal Report (No. 1728-KO) dated 1 December 1977, the President's Report (No.P-2183-KO) dated 7 December 1977, the Loan and Guarantee Agreements dated 4 January 1978, and project data compiled by ADC; perusal of supervision reports and project files in the Bank, field visits in September 1985 and May 1986 to selected project sites; discussions with project staff in ADC and the staff of local offices of the Office of Rural Development (ORD), National Agricultural Cooperative Federation (NACF) and Nonsan Farmland Improvement Association (FLIA), and interviews with Bank staff who have been associated with the project.

II. PROJECT IDENTIFICATION, PREPARATION AND APPRAISAL

Identification

2.1 As the first stage of a plan for irrigation, drainage and tidal land reclamation in the lower reaches of the Geum river 1/ and adjacent areas along the west coast of Korea about 160 km south of Seoul, a project in Ogseo area had been under consideration by ADC since the mid-1960s. Overall surveys, studies and investigations for the Geum river were begun in 1968 by a team from the Ministry of Construction (MOC), the Korea Water Resources Development Corporation (a forerunner of the Industrial Sites and Water Resource Development Corporation - ISWACO), and foreign consulting engineers. The resulting report was presented by MOC in 1972.

2.2 Following recommendations of a Bank mission which visited Korea between 19 March and 1 April 1973 and based on Government request, the Bank included funds in the National Seeds Project. (Loan 942-KO, 1973) for preparing a master plan for the Ogseo project and a feasibility report for a first stage development based on the 1972 report, supplemented by additional investigations.

Preparation

2.3 In March 1974, the Government selected another firm of consulting engineers to assist ADC in preparing these studies. The master plan was completed in July 1975 and the feasibility study in August 1975. The master plan proposed a number of distinct sub-projects or divisions in the lower Geum, Mangyeong and Dongjin river basins, covering a total area of about 102,000 ha of which about 44,000 ha would be newly irrigated, and 58,000 ha, already irrigated, would be improved by firming up water supplies, and providing drainage, access roads and on-farm development. The two principal features of the plan would be an estuary weir on the Geum river and a sea dike across the mouth of the Mangyeong-Dongjin river system. In addition to the estuary reservoir, water supply would also be available from the Daecheong multi-purpose dam, then under construction, Seomjin reservoir on the Dongjin and a number of smaller reservoirs.

2.4 The plan recommended development of the Ogseo project in two phases. Phase I would provide some 27,000 ha of new and 29,000 ha of improved irrigation and would be carried out in two stages. The first stage called for construction of the Geum estuary weir, main and secondary canal and on-farm development works on 40,000 ha in the Igsan and Gimje Divisions, while the second stage included irrigation and on-farm works for 16,000 ha in the Nonsan and Seocheon Divisions. The remaining area of 46,000 ha was to be developed in Phase II. Phase I was found to be technically and economically feasible. However, the financial requirements of the project as proposed were too great (US$250 M in mid-1975 prices, excluding price contingencies) and the Government decided to delay construction of the estuary weir and related works.

1/ The Geum, over 400 km long with a catchment area of about 10,000 km2 is the third largest river in Korea.

2.5 At the same time, the Government decided that ISWACO should proceed with the Daecheong multipurpose dam about 85 km upstream of the project area. Construction began at the end of 1975 and was scheduled for completion in June 1980. Releases from the Daecheong reservoir would permit adequate flow in the lower Geum during the irrigation season to flush the tidal salt water below the confluence of the Nonsan and Geum rivers and enable development of the Nonsan part of the project prior to construction of the estuary weir. ADC in association with the consulting engineers therefore revised the staging of Phase I in an addendum to the feasibility study completed in June 1976 in which it was proposed that Stage I would include development of the Nonsan Division (11,500 ha) and Stage II would include the estuary weir plus development of the Igsan, Gimje and Seocheon Divisions (44,500 ha). Subsequently, the Government requested that the Stage I project scope be expanded to 18,000 ha made up of 11,500 ha irrigation development in Nonsan Division, 3,000 ha of new irrigation in the Taein Division (originally included in Ogseo Phase II), and a 3,500 ha first stage of the Naeseong Watershed Project. The proposed project would be adjacent to and complement the Kumgang Project (Loan 600-KO) which was successfully completed in 1976.

Appraisal

2.6 The project was appraised by a Bank mission which visited Korea from 24 May to 14 June 1977. The mission, in agreement with the Government, reduced the project to benefit only 12,290 ha: pumping stations, canals and on-farm development works would serve new areas totalling 7,090 ha; 3,710 ha out of 5,200 ha of existing irrigation under the control of Nonsan FLIA would be improved. The remaining 1,490 ha in the FLIA area, which would not receive engineering improvements, would receive a more assured water supply. The Government proposals for Taein and Naeseong Divisions were found to be too narrowly defined and not investigated well enough to form the basis for firm cost estimates. These components were therefore deleted from the project. However, funds were provided to carry out necessary studies and prepare related feasibility studies. 1/ Furthermore, about 700 ha were left out of Nonsan Division due to poor soils and steep slopes. These revisions resulted in the appraised project area of 10,800 ha benefiting from project works and another 1,490 ha with a more assured water supply (see Map).

Project Description

2.7 The project, as agreed at negotiations, comprised the following components:

a) for the newly irrigated area (7,090 ha), irrigation facilities comprising nine pumping stations, 120 km of main and 70 km of secondary canals; and land development comprising land consolidation on 3,070 ha, conversion of 1,510 ha of upland and 270 ha of forest to irrigated paddy, and tertiary canals and drains on 2,240 ha of existing rainfed paddyland;

1/ For Naeseong preparation, funds were to be drawn out of Loan 1319-KO -

b) for the existing irrigated areas (3,710 ha), improvements to the irrigation system over the entire area, drainage improvement on 2,500 ha and land consolidation on 2,770 ha;

c) for the areas with improved water supply only (1,490 ha) the transfer of the source of irrigation water from the Tabjeong reservoir by gravity to the Geum river by pumping;

d) construction of a project field office and four sub-divisional offices;

e) short-term consulting services to assist in project implementation and in preparation of feasibility studies for future irrigation and area development projects; and

f) overseas training for ADC staff.

2.8 The Agricultural Development Corporation was given the task of project management. Responsibility for designs and procurement was to rest with ADC headquarters and the implementation and supervision of civil works with the Project Office in Nonsan to be established under the project.

III. PROJECT IMPLEMENTATION

Loan Negotiation and Effectiveness

3.1 Negotiations for the loan took place in Washington during 7 - 15 November 1977. The Bank's Board of Directors approved the loan on 22 December 1977. The loan was signed on 4 January 1978 and became effective on 29 March 1978.

Implementation Progress

3.2 At appraisal it was estimated that construction would begin in early 1979 and be completed by mid-1982 with a loan closing date of 30 June 1983. Construction began in early 1980 and it is now estimated that it will be completed by the end of 1988, although the loan closed on 30 June 1985 (see para. 3.21).

3.3 Negligible progress was made during the first six months after loan effectiveness and it was not until November 1979 that the contracts for the first three sub-projects were awarded after more than a year for design. During this period ADC completed a study of the pumping alternatives which resulted in appreciable changes to the pumping arrangements. Work on the first three sub-projects was completed in December 1983 having taken about four years instead of the two and a half years forecast in SAR for the works. Construction periods for the other sub-projects, which are not yet completed, are expected to be of about the same duration.

Sub-project	Contract Award	Contract Completion	Duration (Years)
I, II, III	November 1979	December 1983	4
IV	July 1981	June 1986	5
IV-1	July 1983	July 1984	1
V	April 1983	September 1986	3.5
VI	February 1985	October 1988	2.5
VII	October 1984	December 1988	4

3.4 SAR and estimated actual implementation schedules are compared in Table 2. The delays were mainly attributed to the Government's difficulties in providing adequate budget allocations to ADC due to rapid inflation during the early years of the project. Between 1978 and 1981 the wholesale price index doubled; since then inflation has dropped to about 2% but by 1982 self-sufficiency in cereals had nearly been attained, resulting in lower prority being given by Government to irrigation projects.

Design and Construction

3.5 At appraisal the project was divided into four sub-projects. Following a request made by ADC in January 1979 the project was divided into seven sub-projects on the following grounds:

- rationalisation of the construction works adapted to the complex irrigation system;
- funding constraints on local investment schedule; and
- more even allocation of construction cost for sub-projects.

The standard of design and construction is generally high and the works appear adequate for their intended purpose. Design of civil works and specifications for pumping plant were carried out by the staff of ADC assisted in the fields of mechanical plant, irrigation and drainage by 8 man-months from three foreign consultants. Power lines and an additional sub-station were designed by Korea Electric Company.

3.6 Design was carried out generally in accordance with the provisions of the SAR but some changes were made to the arrangement of pumping stations (see paras. 3.10 and 3.11) and to drainage design criteria para 3.14. Following international competitive bidding, all contracts, civil and electrical/mechanical, were awarded to Korean contractors and were supervised by ADC. The work was divided into seven sub-projects, each with separate contracts for civil works and for pumping equipment except that the pumping equipment for sub-projects I, II and III were grouped into one contract. An additional sub-project IV-1 for a drain and drainage pumping station was awarded to the contractors for sub-project IV, even though the geographical area of the work was in the location of sub-projects II and III then nearing completion.

Water Supply

3.7 Soengdong pumping station draws water from the Geum river to supply 3,854 ha with irrigation. Although the Guarantee Agreement requires the Government to guarantee sufficient releases from Daechong dam for irrigating 5,000 ha in this project, no specific guarantee has yet been received by ADC. To date there has always been sufficient water of adequate quality.

3.8 The appraisal report expected 10,400 ha to be supplied from Tabjeong reservoir but this is now expected to be only about 7,500 ha made up as follows:

Tabjeong pumping station	3,995 ha
Right bank canal, including supply to Wangjeong pumping station	2,400 ha
Left bank canal	1,100 ha
	7,495 ha

3.9 FLIA engineers are said to have studied recent hydrological information and consider that there will be no problem in supplying this area even during a once-in-ten years dry year. The storage in Tabjeong reservoir is 31.6 million cubic metres, and inflow between June and September in the once-in-ten dry year should be about 50 million cubic metres. After allowing for losses from the reservoir, there should be sufficient water for 1,072 mm of irrigation on 7,500 ha which is the diversion requirement estimated in the appraisal report for the once-in-ten dry year.

Irrigation Pumping Stations

3.10 The appraisal report proposed that water should be lifted at two pumping stations from the dredged Nonsan river, (augmented when necessary, by pumping from the Bongjeong pumping station, upstream on the Geum river) into the existing right and left bank canals from Tabjeong reservoir. Instead, a new drainage and irrigation primary pumping station has been constructed at Seongdong (see Map), about 8 km downstream of Bongjeong which delivers into the Seongdong canal. This canal connects to the right bank canal from the Tabjeong reservoir and, through a new inverted syphon under the Nonsan river to the Chaewun (left bank) canal at the new Bonghwa irrigation secondary pumping station. The new Sinhwa tertiary pumping station has been constructed near the southern end of the left bank main canal instead of a pumping station on the new Eunjin canal which was proposed in the SAR. The Chaewun canal also supplies the Yongsan and Jugbon tertiary pumping stations which were not included in the appraisal proposals.

3.11 The SAR proposed two pumping stations on opposite banks of the Tabjeong reservoir: these have been amalgamated into one Tabjeong pumping station at the dam. The total number of irrigation pumping stations has increased from nine to eleven but the total installed horsepower of the pump motors is almost unchanged (13,055 hp instead of 13,000 hp proposed in SAR) as summarised below.

Irrigation Pumping Stations	Appraisal No.	Appraisal Installed hp	Estimated Actual No.	Estimated Actual Installed hp
Primary	5	10,150	3	8,050
Secondary	4	2,850	4	4,475
Tertiary	0	0	4	530
Total	9	13,000	11	13,055

The maximum static pumping lift is about 70 m (Table 3).

Canals

3.12 The total length of main canals has increased slightly from 120.2 km at appraisal to 122.6 km. The main change is the connection from Seondong to Bonghwa pumping station. The length of secondary canals was underestimated at appraisal and has now doubled from 70.6 km at appraisal to the estimated actual length of 141 km.

Drainage

3.13 The SAR did not define the drainage proposals in detail. The area of land with improved drainage is now estimated to be 2,735 ha, some 235 ha more than proposed in SAR. This is achieved with a considerable saving in length of drains (32.5 km instead of 60 km) but with nine drainage pumping stations instead of two proposed in the SAR.

3.14 The SAR stated that the optimum drainage intensity should be fixed at 7 l/s/ha but that exact criteria should be determined during final design. Drainage pumping stations in the early contracts were approximately in accordance with this criterion (Table 4). The 1982 supervision mission suggested that the capacity of sub-project IV-1 pumps was uneconomical and the duty was reduced from 13 to 10 l/s/ha. In 1983, the Ministry of Agriculture revised national criteria so that instead of coping in 48 hours with floods with ten years' recurrence, drainage pumps were designed to cope in 24 hours with floods with 20 years' recurrence. The drainage pumps in sub-project VII thus have duties between 15 and 32 l/s/ha, which may be considered high by normal standards.

Land Development

3.15 Detailed topographical survey revealed that the area of land with suitable slopes that could be economically newly irrigated economically, was less than assumed at appraisal. Conversion of forest land to rice land was cancelled because some of the area could not now be commanded by the irrigation system due to change in location while the rest was used as burial grounds. Upland conversion to paddy for which the farmers had to contribute 50% of the costs was only partly accepted by the farmers. In order to compensate for the reductions in land development described above the area of tertiary development was increased. The changes from appraisal proposals are summarised below:

	Appraisal	Estimated Actual
	(ha)	
Land consolidation - existing irrigation	2,770	2,937
- new irrigation	3,070	1,866
Conversion of upland to rice land	1,510	739
Conversion of forest to rice land	270	nil
Tertiary development	2,240	3,865
Drainage improvement a/	940	1,393
Total	10,800	10,800

a/ See Table 17 for details.

Studies

3.16 The project included funds for preparation of two future irrigation and area development projects. The first was to have been in the Dongjin river basin and was intended to include about 3,000 ha of new irrigation in the Taein area and extensive rehabilitation in the adjacent Dongjin and Buan FLIA areas. The second was to have been in the Naeseong watershed in the upper reaches of the Nakdong river. Neither of these studies were carried out under the project.

Project Cost

3.17 A comparison of appraisal cost estimates with actual expenditures (up to 30 June 1985 - loan closing date) as well as with estimated final costs at completion of works in 1988, is given in detail in Tables 5 and 6 and summarised below:

	Cost Comparison			
Expenditure Category	Appraisal Estimates		Estimated Final Costs	
	(Won M)	(US$'000)	(Won M)	(US$'000)
Civil works	24,400	50,600	54,500	67,300
Equipment and materials	4,400	9,200	14,100	18,300
Other expenditures	8,000	16,200	13,400	17,400
Total	36,800	76,000	82,000	103,000
Developed area (ha)	10,800		10,800	
Unit Cost/ha	3.4	7.0	7.6	9.5

3.18 As shown above, the total cost of the project, on completion, would be W82 billion (US$103 M) compared to appraisal estmates of W36.8 billion (US$76 M), a 123% cost overrun. Expressed in dollars, which reflect the depreciation of the Won (about 80% over the period 1978-1985), the cost overrun would be substantially lower at 36% (see Table 6). The cost of irrigation and land development amounts to W7.6 M (US$9,500) per ha which is about 124% (36%) above appraisal estimates.

3.19 The greatest cost increase was for equipment and materials (220%), followed by civil works (123%), and other expenditures (68%). Within civil works, drainage canals and land consolidation components proved most expensive on an overall as well as on a unit cost basis. As can be seen in Table 7 the overrun was caused partly by price escalation (59%) and partly by quantity changes due to design modifications (41%); price escalation itself was the result of inflation and depreciation of the Won exacerbated by the prolonged implementation period. The cost profile of the project confirms the experience in other countries that irrigation projects are expensive and grow more so as the easier opportunities have been exploited.

Project Financing

3.20 The Bank was expected to finance the project's foreign exchange requirements of US$36 M (W17.4 billion) accounting for 47% of total project cost. Local expenditures of W19.4 billion (US$40 M), representing the balance of the project cost, were to be met through annual budgetary allocations to ADC. Because of substantial cost overruns, loan disbursements contributed only 35% of total project cost.

3.21 Due to considerable implementation delays, the Bank and the Government agreed in 1981 that the loan disbursements would be limited to five sub-projects. Later, in September 1984, one more sub-project (VI) was included for loan financing, leaving sub-project VII to be fully funded by the Government.

3.22 In June 1980, the disbursement rate for civil works was raised from the original 50% to 65%, as a temporary measure to ease a budgetary constraint during a period of rapid price escalation. Since continued disbursement at 65% would have led to the loans being used up before completion of those sub-projects on which the Bank had agreed to disburse, the percentage of disbursement was reverted to 50% with effect from 11 February 1982. Actual disbursements lagged substantially behind appraisal estimates. By June 1983, the original closing date, only about 50% of the loan had been disbursed (Table 8) and it took until 26 December 1985 to complete full disbursement of the loan. 1/

1/ Although the loan was formally closed on 30 June 1985, the Bank agreed to meet withdrawal applications received up to 30 November 1985 to allow processing before 31 December 1985.

Loan Allocation

3.23 At the borrower's request, the Bank loan was re-allocated using the unallocated funds and transfers between different categories (Table 9). As a result, the amount allocated to equipment and materials almost doubled as shown below:

Allocation of Loan Proceeds

Expenditure Category	Planned	Revised in Nov. 1982	Final
		(US$ M)	
Civil works	23.0	21.7	22.1
Equipment and materials	6.8	14.0	13.7
Consultants' services & training	0.4	0.3	0.2
Unallocated	5.8	-	-
Total Allocation	36.0	36.0	36.0

IV. INSTITUTIONAL PERFORMANCE AND DEVELOPMENT

The Agricultural Development Corporation

4.1 The Agricultural Development Corporation, the implementing agency of the project, is a semi-autonomous authority within the Ministry of Agriculture and Fisheries. The main activities of the Corporation are the promotion of agricultural production through development of land and water resources and the provision of technical assistance to Farmland Improvement Associations. A new line of activity - fisheries development - will soon be added to ADC's portfolio and the Corporation's name possibly changed to Agricultural and Fishery Development Corporation. ADC's proposed diversification into the fisheries sector is intended to sustain its overall volume of operations which, in recent years, has declined due to a severe drop in irrigation projects sponsored by the Government.

4.2 ADC is managed by a president, assisted by a vice-president and a six-man board of directors. There are three executive directors (Administration, Project Implementation and Technology). The current staff of the Corporation numbers 1,834 comprising irrigation engineers (1,022), mechanical engineers (33), electrical engineers (31), architectural engineers (10), pedologists (26), geologists and hydrogeologists (110), economists (19), agronomists (50), adminstrators (333), and other support staff (197), serving headquarters, nine provincial offices, and seven project offices (see Chart). The latter are specially set up to implement specific projects. Since the merger of the Union of Land Improvement Associations with the Groundwater Development Corporation in 1970, ADC has completed eight large-scale comprehensive agricultural development projects. Its on-going portfolio includes seven comprehensive and 91 medium-scale agricultural development projects.

4.3 A project office was established in Nonsan with project funds under the direct supervision of the Director of Project Implementation, and made responsible for implementation and supervision of construction for the Ogseo project, while the responsibility for design and procurement rested with ADC head office. The office was established in ADC headquarters in February 1978 as agreed, and it started operating in Nonsan from March 1979, more than a year later than agreed.

4.4 As expected at appraisal, ADC's performance in executing the project was of a high standard. This was mainly due to the stability, continuity and competence of project management. The contribution of Ogseo project to the improved capability of ADC is difficult to isolate since ADC has gained from concurrent implementation of several projects as well as from interaction with Bank staff and expatriate consultants provided under various projects. The major institutional benefits of this interaction include (a) the introduction of improved procurement procedures (b) familiarity with different designs for irrigation schemes (c) greater attention to economic considerations in the design of irrigation works and consequently an appreciation of the importance of economic analysis in project appraisal, and (d) development of a comprehensive approach to irrigation development instead of viewing it purely as an engineering task. The gained experience and expertise has enabled ADC to get international recognition as evidenced by its expanding consulting services abroad.

4.5 A substantial portion of the Corporation's business is sponsored by the Government. Under agreements with the Government, ADC is reimbursed for its expenditures and in addition receives a certain amount of fees determined by the Government. In 1985, over 60% of ADC's long-term funds has come as advances for work carried out on behalf of the Government (Table 10). After completion of the Government-sponsored projects, the advances from the Government are transferred to FLIA together with the cost of works.

4.6 As in other projects, ADC has faced problems concerned mainly with delays and cost overruns. These problems have resulted primarily from inadequate local funds, a factor outside the control of ADC's management. A side-effect of funding difficulties is seen in slow completion of projects as evidenced, in part, by an increase in the value of contracts in progress which rose from W448 billion in 1982 to W696 billion in 1985, 1/ and falling profitability as measured by the ratio of operating profit to operating assets (Table 11). The Corporation, which earned an operating profit of W1 billion in 1982 and W1.6 billion in 1983, barely managed to break even in 1984, but showed a marginal improvement in 1985 largely due to a fall in general and administrative expenses.

1/ After completion of projects/sub-projects, the contracts in progress are transferred to FLIAs. The amounts lying at year-end are the remaining balance of accumulated costs after the transfer to FLIA of the completed projects.

Consulting Services

4.7 Project consultants provided valuable assistance to ADC in project implementation including some transfer of knowledge. Of the 18 man-months envisaged at appraisal, 15 man-months have been utilised almost equally between the four consultants employed by ADC (see Table 12). A good relationship existed between the consultants and the Corporation.

Procurement

4.8 Following implementation of several Bank-financed projects, ADC's procurement procedures became well established and coordinated with the Office of Supply. As a result, no major difficulties were encountered in meeting the requirements of 'Bank Group Guidelines for Procurement'. The successful contractors for civil works were all Korean firms.

Operation and Maintenance

4.9 On completion of construction, the works are handed over to FLIA for operation and maintenance. To date, the first three sub-projects and sub-project IV-1 have been handed over and are being adequately operated and maintained by the Nonsan FLIA; cost recovery is high, almost reaching 100% (para. 4.19). Details of irrigation pumping station operation are shown in Table 3.

Training

4.10 As shown in Table 12 training was provided to 20 civil engineers of ADC. Seven engineers studied hydrology at the United States Bureau of Reclamation (USBR) and Colorado State University for periods of 6-11 months in 1983, three engineers attended two to three weeks water management courses at USBR and in Taiwan in 1984, and 10 engineers attended the International Commission for Irrigation and Drainage Congress in Chile and other countries in 1985.

Accounting and Reporting

4.11 ADC has maintained project accounts in a satisfactory manner, and as required under the Loan Agreement, had its final accounts for each financial year up to 1985 audited by a recognised firm of chartered accountants who have issued unqualified reports.

4.12 Quarterly reporting on physical and financial progress followed practices and formats established under Yong San Gang Irrigation Project Stage I. These reports were submitted regularly incorporating improvements suggested by a Bank supervision mission in August 1978. A quantitative analysis of agricultural performance was also requested to be compiled in the annual report for the project. ADC saw the advantages of these improvements and implemented the changes as suggested by the Bank.

Agricultural Inputs and Supporting Services

4.13 As appraised, the project did not include any provision for farm inputs or for strengthening of agricultural services in the project area. These services were considered adequate to meet the anticipated needs of the project beneficiaries. Although the capacity of these services has not been tested fully due to implementation delays, available evidence indicates that the servicing agencies are well organized to provide adequate services and help project beneficiaries in realising the benefits of irrigation and land development promoted by the project.

4.14 Farm mechanisation in Nonsan has expanded rapidly reaching its peak in 1983. As shown in Table 13, powertillers increased over the period 1978-85 from 1,785 to 3,975, tractors from 24 to 139, combine harvestors from 1 to 116, binders from 44 to 136, transplanters from 6 to 390 and power sprayers from 501 to 2,757. It is noteworthy that - although relatively small in absolute numbers - tractor purchases increased more rapidly than the acquisition of powertillers despite the latter's advantages for small farms. Tiller mechanisation developed at a slower pace in the project area than in the country as a whole. The number of tillers increased by about 120% compared to 150% for the whole country. Tractor mechanisation showed a faster growth in the project area (480%) than for the country as a whole (365%).

4.15 In Nonsan county, fertilizer use (NPK) has increased from a total of about 8,000 tons in 1978, peaking in 1981 at approximately 10,000 tons. Reflecting the decline in HYV rice cultivation, fertilizer consumption thereafter has fluctuated annually without ever attaining its peak level, more or less in line with the national trend. The supply of agricultural chemicals increased from about 120 tons in 1978 to about 135 tons in 1985.

4.16 The Office of Rural Development, a department of MAF, is responsible for research and agricultural extension services. Although the number of extension agents in the area has not been increased, services available to farmers are considered adequate, given the high level of efficiency of extension agents and the responsive and market-oriented farmers. The National Agricultural Cooperative Federation has been active in the area supplying agricultural loans, marketing farm products and inputs, and providing storage. Loans extended by NACF have increased considerably allowing farmers to purchase the needed inputs. The volume of short-term loans increased from W4 billion in 1978 to W15 billion in 1985 while term loans rose from W705 M in 1978 to W1,849 M in 1985 (Table 14).

Farmers' Organizations

4.17 Farmers' organizations in the project area consist of Nonsan FLIA with 15,000 households, 418 Heung Nong Gye (HNG) 1/ with 21,235 members, and 15 agricultural cooperatives with 25,220 members. FLIA and agricultural cooperatives have remained by and large constant throughout the project implementation period while some new HNG have been organized during this period (Table 15). Of the 418 HNG, 271 were organized by FLIA and the balance 147 by ADC. The performance of these farmers' organizations has been satisfactory.

1/ An HNG is established as a separate organization in each village served by the FLIA acting as a point of contact between the FLIA and the farmers.

Compliance with Covenants

4.18 Table 16 sets out the current status in regard to the compliance with covenants stipulated in the Loan and Guarantee Agreements. Brief explanatory comments on each covenant are also noted therein. It is seen that the covenants have generally been complied with satisfactorily. However, Section 3.06 of the Loan Agreement requires ADC to furnish to the Bank a detailed plan for operation and maintenance of the facilities included in the project. This has not been done. The guarantee required by Section 3.02 of the Guarantee Agreement has not been given (see para. 3.7). The PCR mission was not able to establish that Daechong and Tabjeong dams were being periodically inspected as required by Section 3.03 of the Guarantee Agreement.

Cost Recovery

4.19 The Nonsan FLIA assumes responsibility for recovery of irrigation charges from farmers on projects completed and transferred to the association by ADC. In taking over a project, FLIA would have to meet 30% of its capital cost, through a loan from NACF repayable at 5.5% interest per year for 35 years with an initial five-year grace period while the balance of 70% is a grant from the Government. FLIA therefore sets irrigation charges at levels to recover all operating and maintenance costs and at least 30% of the capital cost over a period of 35 years. Sub-projects I, II and III have been handed over to the Nonsan FLIA. Irrigation charges vary according to the cost of pumping. On average farmers pay the equivalent or deliver 280 kg rice/ha per year. 1/ FLIA's records indicate that the recovery of irrigation charges from the farmers and the repayment of the loan by FLIA to NACF have been regular.

V. AGRICULTURAL IMPACT AND ECONOMIC RE-EVALUATION

A. Impact on Agricultural Production

Intended Impact

5.1 The major production impacts intended by the project were increases in annual rice production to about 53,000 tons, from the pre-project 30,000 tons and annual barley production to about 20,000 tons from the pre-project 6,000 tons. These were expected to be achieved principally by accelerating the adoption of high yielding variety (HYV) of rice in the summer and by expanding barley planted area in the winter.

5.2 Total project area appraised for irrigation and land development was 10,800 ha. It was projected that full development production would be attained in 1986, four years after expected completion of the project works in 1982.

1/ Charges range from 200 kg/ha to 400 kg/ha.

Area and Crop Development

5.3 Table 17 sets out the revised irrigation and land development area compared with that at appraisal, together with corresponding pre-project land use status and the completed area at end 1985. As can be seen, the conversion of 270 ha of forest to paddyland has been cancelled and the upland conversion to paddyland has been reduced, from 1,510 ha to 739 ha. There has also been a reduction in area for land consolidation from 5,840 ha to 4,803 ha. On the other hand, areas for drainage improvement and on-farm development have been increased, making up for the above reduced areas. Total project area therefore remains at 10,800 ha.

5.4 Because of the above changes, there was some alteration in locations of the project area as reflected in the different pre-project land use between the revised and the appraised plan. About 2,080 ha of upland, forest and paddylands included in the appraised project were excluded, and about 2,080 ha of the existing paddylands located outside the original project area were added to the revised project area for additional drainage improvement and on-farm development. The development works so far completed by the project cover about 50% or 5,300 ha of total project area.

5.5 Information on crop development which has taken place over the past six years in the project area is drawn from various data provided by ADC. It should be noted that the impact of the project on crop production is not strictly comparable with appraisal estimates since there were some changes in the appraised irrigation and land development plan during the course of project implementation.

5.6 Land use. Annual changes in land use during the past six years, compared with the appraisal targets are given in Table 18. The irrigated paddyland has increased from the actual pre-project (1980) 4,330 ha to the current 6,504 ha. The expected change in land use has not been realized largely because of the delay in project implementation.

5.7 Use of HYV rice. Annual estimates of the area planted to HYV and traditional varieties 1/ of rice from 1980 to 1985 in the project area are given in Table 19. About 3,400 ha or 34% of total rice cropped area was estimated to be planted with HYV rice in 1985. As can be seen in the table, use of HYV has significantly declined since 1980 (pre-project). As the appraisal projection for the same period is not given in the appraisal report, no comparison between the two can be made. However, in comparison with the appraisal projection for full development (1986 and on), the actual use of HYV is substantially lower than expected. At appraisal, it was expected that the area under HYVs would increase to about 8,000 ha or about 75% of total rice cropped area. Table 21 shows changes in use of HYVs over the last eight years in Nonsan and Gun (county) where the project area is located.

1/ HYV are commonly known in Korea as "Tongil" type varieties developed from crosses between indica (IRRI lines) and japonica. Traditional varieties in this report refer to the improved japonica either developed in Korea or introduced from Japan. Use of these terms (HYV and Traditional) are a little misleading as the yield difference between the two is not so great. However, to maintain consistency with the appraisal report, they are also used in this report.

5.8 The lower actual use of HYV rice is mainly attributed to the inferior varietal characteristics (other than its high yielding capacity) of the presently available HYVs. Compared to traditional varieties HYVs are inferior in eating quality as reflected in their lower market price. 1/ HYVs require more fertilizers to obtain the potential higher yield, 2/ and are less tolerant to occasional lower temperature in September when the crop is entering its ripening stage immediately after flowering. 3/

5.9 Non-rice crops. Crops other than rice include barley, strawberry, garlic and other off-season vegetables such as tomato and cucumbers. 4/ These crops are grown as a second crop 5/ after rice without irrigation. Other than barley, growing of these crops was not foreseen at appraisal. Barley was then a substitute for foodgrains. However, attainment of near self-sufficiency in rice in the late 1970s led to reduced Government support for the campaign to grow-more barley, which resulted in lower purchasing quotas for barley by the Government. Consequently, farmers looked for more profitable alternatives.

5.10 It is therefore difficult to claim that diversification of cropping after rice is attributed to the project works, because these second crops are grown virtually without irrigation, and this change has taken place throughout the country. However, it is likely that the general development 'with project' resulted in a more rapid growth in the area devoted to the diversified second cropping. In addition, it is reported that the drainage condition improved by the project made it possible to cultivate more second crops.

1/ Average farmgate prices for HYV and traditional rice in 1985 were W56,000 and W66,000 per 100 litres (80 kg), respectively (Grade B rice).

2/ The current recommended fertilizer rates are 150:95:110 kg per ha (NPK) for HYVs and 110:70:75 kg per ha (NPK) for traditional varieties. (Average for the plain area in Korea).

3/ Lower temperature during this crop stage affect the rate of grain filling and decrease the yield. Low temperatures occured in September 1980 and resulted in a nationwide reduction in crop harvest (2 million tons less than the 1979 harvest). Since then, the use of HYVs has significantly declined.

4/ Strawberry and other off-season vegetables are intensively cultivated in the hot-house with plastic sheets, installed in the paddy field after harvest of rice. The area of this type of cultivation is limited as it requires high investment and intensive crop management.

5/ Prevailing cropping calender = barley (late October - May/June): strawberry (late October - late May): garlic (late October - early June): tomato/cucumber (early March - early June).

5.11 Cropping intensity. It is estimated that the overall cropping intensity has increased from the actual pre-project 105% (1980) to 127% (1985), as shown in Table 19. This increase was due to the increased cropped area of second crops after rice. The latest cropping intensity (1985) was about 40% lower than that projected at appraisal. This lower cropping intensity is attributed to change in the Government support for barley cultivation, which resulted in introduction of intensive cultivation of high value crops in small areas as explained in paras 5.9 and 5.10.

5.12 Crop yields. Table 20 sets out the pre-project (actual) and the latest crop yields (1985) estimated by ADC, compared with the appraisal estimates. The estimated 'actual' pre-project rice yields (1980) in the irrigated area (non-consolidated as well as consolidated) are slightly different from those at appraisal pre-project year (1977). This is due to the delay in project implementation, and also due to a considerable increase in drainage improvement area in the existing consolidated area. 1/ Rice yields in the non-consolidated area are estimated to have increased over three 'without project' years from 3.4 ton/ha to 4.0 ton/ha for HYV. However, the actual pre-project rice yields in the consolidated area where drainage improvement was required were slightly lower than the appraisal pre-project yields. Due to poor drainage conditions in certain areas in the extended drainage improvement area, average yields tended to be lower.

5.13 Rice yields presently attained in the irrigated (non-consolidated) paddyland have exceeded the appraisal full development yields (1986). The actual yields (1985) were 4.3 ton/ha for traditional varieties and 5.0 ton/ha for HYV, whereas the appraisal projections (1986) were 4.2 ton/ha and 4.7 ton/ha respectively. The present rice yields in the consolidated area are estimated at 4.8 ton/ha for traditional rice and 5.5 ton/ha for HYV rice. These have also exceeded appraisal projections, which were 4.7 ton/ha and 5.2 ton/ha respectively.

5.14 The mission has some reservations on the above higher yields estimated for the consolidated paddylands. Although it is generally recognized by the Ministry of Agriculture and Fisheries that paddyland consolidation in Korea leads to an average yield increase of 330 kg/ha, no survey has been conducted to quantify the effect of the consolidation on rice yields in the project area. Moreover, the mission's discussion with agricultural staff of ADC and Office of Rural Development in the project area reveals that it is difficult to quantify the actual extent of yield increase.

5.15 Land consolidation itself may not necessarily result in much yield increase compared with yield attained in the non-consolidated irrigated paddyland, particularly in a country like Korea where high yield has been attained in the non-consolidated paddyland. It appears that the real effect of the land consolidation on rice cultivation is in terms of reduction in the production cost due to saving of labour input through easy crop management and mechanization, and saving of irrigation water. Available information, however, is inadequate to assess the effect in this regard. Furthermore, farmers tend to apply a higher level of fertilizers and with mechanization have better land preparation on consolidated areas which could result in higher yields.

1/ This change was not foreseen at appraisal. The drainage improvement area in the existing consolidated area has been increased from 940 ha to about 1,400 ha.

5.16 Barley yields presently attained (2.5 ton/ha) have not yet reached the level of appraisal projection (2.8 ton/ha for non-consolidated area and 3.0 ton/ha for consolidated area). The appraisal estimate was made on the assumption that barley would receive supplementary irrigation in April and early May when the crop is normally short of water. 1/ Barley presently cultivated after rice is however not irrigated. The FLIA in the project area does not operate the irrigation system during the non-rice crop season.

5.17 Achievements on crop yields other than rice and barley cannot be compared with the appraisal projection as these crops were not expected to be cultivated in the irrigated paddyland according to the appraisal report.

5.18 With regard to the yield development period, the appraisal report assumed that farmers would attain the projected yield levels over four years after completion of civil works. ADC estimates show much earlier attainment of the full development yields which exceed the appraisal projection in the case of rice. This fast achievement of high yields is probably due to farmers' ability to apply good crop management techniques.

5.19 Overall crop production. Development of annual total crop production over the past six years is summarised in Table 19. Rice production has increased from the pre-project 35,000 tons to about 44,000 tons (1985). Barley production has also increased from about 1,000 tons to about 3,800 tons.

Impact on Farm Incomes

5.20 The appraisal report assumed increases in farm incomes based on the calculation of changes in net agricultural income before debt service for three different farm sizes as follows:

		Farm Income (W '000s)		
Size of Farm	Proportion of Farms (%)	Future Without Project	Future with Project	% Change
0.25 ha	38	320	385	24
0.7 ha	31	590	755	28
1.7 ha	31	1,075	1,450	35
. . . . .	Average	. . . . .		
0.8 ha		640	830	30

Restated in 1985 prices, future without and future with project farm incomes would be W1,356,000 and W1,758,000 respectively for the 0.8 ha farm.

1/ S , para. 5.09, page 33, SAR.

5.21 The effect of the project on farm income has been ascertained by preparing a farm budget (Table 22) for an average farm size of 0.8 ha using crop budgets and financial prices shown in Tables 23 and 24. As in appraisal, the analysis did not take into account non-agricultural income, which in 1984, averaged 33% of the total household income. The PCR estimates show that net agricultural income in 1985 prices is about W1,150,000 before the project, W1,475,000 in the future without project and W1,990,000 with the project at full development, reflecting an incremental increase of 35%. Project-induced improved irrigation and drainage facilities and land consolidation where it occurred, have no doubt provided an improved production base to pursue agricultural production as a means to raising income and quality of life, however it must be emphasised that the most important factor contributing to increased incomes has been the Government rice price. 1/

B. Economic Analysis

Appraisal Estimates

5.22 At appraisal, the project's economic rate of return (ERR) was estimated to be 12% based on the following assumptions:

- project life of 50 years, including an implementation period of 4.5 years;
- full development reached 4 years after completion of works i.e. in 1986;
- prices of rice, barley, soyabean and chemical fertilizers based on projected 1985 world market prices in 1978 terms;
- all farm labour valued at W2,500/man-day during cropping season and W1,500/man-day during the winter;
- use of a standard conversion factor of 0.89 to express local costs in terms of border prices;
- consideration only of incremental crop production (rice and barley in the 'with project' situation) in 10,800 ha scheduled for full irrigation and land development. Although there will be some additional benefits on the 1,490 ha due to more assured water supply, these were not quantified for rate of return calculations.

1/ See also "Foodgrain Policy in the Republic of Korea: The Economic Costs of Self-sufficiency" by Michael V. Martin and John A. McDonald: Economic Development and Cultural Change Vol. 34 No. 2, January 1986.

PCR Estimates

5.23 The recalculation of the project's ERR essentially follows the appraisal report. The main differences are:

- actual and estimated actual costs (Tables 25) and crop production data (Table 19) are used for project years 1978-1985; Past expenditures have been restated in 1985 prices, using the wholesale price index;

- consideration of incremental production in the 'with project' situation included rice, barley, strawberry and vegetables (garlic) (Table 27);

- all values are expressed in 1985 terms, the project's final disbursement year; 1/

- prices of internationally traded goods are based on January 1985 World Bank commodity price forecasts (Table 26), while those of non-traded goods and services including farm labour are based on domestic prices. Domestic prices have been translated into border won by applying conversion factors of 0.84 for heavy equipment costs; 0.76 for fuel lubricant costs; 0.79 for indirect labour costs; 0.64 for unskilled labour including farm labour; and a standard conversion factor of 0.94.

5.24 The recalculated economic rate of return for the project on this basis is 10% (Table 28), 2% lower than the appraisal estimate. The principal factors which have contributed to the lower ERR as compared with appraisal estimate are delays in benefits due to prolonged implementation period and higher investment costs. The adverse effects of these two factors on ERR were not fully offset by additional benefits from high-value crops which were not foreseen at appraisal.

VI. BANK PERFORMANCE

Overall Performance

6.1 Despite delays in implementation, Bank assistance to the project allowed acceleration of investment programmes in land and water development to support Government's efforts to achieve foodgrain self-sufficiency, and improved incomes and living standards of the farming population. Within a master plan with a rational sequence for the development of the lower Geum river basin and in line with the overall river basin development programme, the project provided a comprehensive package of irrigation, drainage and land improvement works in Nonsan area. Given the adequacy of agricultural support services (extension, credit and marketing), project works, to provide complementing irrigation water and land improvements including drainage was entrusted to a single agency (ADC). The project formulation within this context is therefore considered appropriate and justified.

1/ No distinction has been made in the prices for incremental production prior to 1985 as the quantity is small in relation to the total project.

6.2 A strong feature during project implementation has been the constructive dialogue and rapport between Bank staff and the executing agency. This association has yielded several institutional benefits to the ADC (see para. 4.4). Project implementation was monitored closely by the Bank, drawing attention to potential difficulties and eliciting appropriate action from Government agencies such as EPB and MAF. In particular, the importance of adequate budgetary allocations which remained the single greatest problem throughout the project was stressed by the Bank during supervision.

Supervision

6.3 The Bank's supervision effort was adequate. The Bank fielded seven supervision missions in the 7.5 year disbursement period. The mission was technically strong and there was good staff continuity between missions. As a result of suggestions made by the Bank during supervision, improvements were made resulting in improved reporting and better provision of local funds. Nevertheless, cuts in public spending have affected the level of local funds channelled to project financing, considerably delaying the completion of project works, a factor beyond the control of the ADC or the Bank.

VII. CONCLUSIONS AND LESSONS LEARNED

7.1 The project is making a valuable contribution to the Government's goal of reducing imports of foodgrains. The project has strengthened the infrastructure for the irrigation and drainage and other complementary land improvement activities in Nonsan. This has allowed the farmers in the project area to participate in the overall economic growth and improvements in social welfare that have occurred in rural areas over the last two decades.

7.2 Government support policies for rice (particularly keeping the price above the world market price) have provided adequate incentives to farmers to grow rice. Reduced Government support to barley production in recent years has rendered its production unattractive as demonstrated by the decline in barley cultivation compared to that envisaged at appraisal. On the other hand, production of high value horticulture crops has increased significantly. Increased use of vinyl covers, as cheap greenhouses, is the result of farmer initiative responding to profitable opportunities made possible, in part, because of the improved land and water conditions provided by the project. The combined effect of these developments is an increase in the incomes of project beneficiaries, although this is still not attractive enough to stem the outflow of younger persons to the cities.

7.3 The concurrent implementation of several projects by ADC makes it difficult to single out the impact of the Ogseo project on the institutional development of ADC. The project, however, contributed successfully to the training of the ADC's staff, and also through technical assistance during implementation, saw ADC develop into a competent and experienced design and construction agency with full technical and managerial capabilities.

7.4 The following major lessons for design of future projects can be drawn from the implementation experience of the Ogseo project:

a) To avoid implementation delays, it would be necessary to obtain specific commitment from the Government in the Guarantee Agreement to allocate the necessary local funds:

b) In countries without food shortages high yielding varieties of rice cannot easily compete with traditional varieties which, despite lower yields, find better markets because of tastes and preferences. This suggests a need for more research directed to producing HYVs which meet consumer preferences.

c) Higher incomes from non-farm employment resulting from industrial development have far reaching implications for the sustainability of domestic agricultural production, given the land tenure laws permitting maximum holdings of only 3 ha and the outflow of younger persons from farms. Revision of farm size ceilings is essential to prevent smallholdings from becoming 'nominal' assets which no longer produce.

d) High recovery of irrigation charges by a Government agency providing O & M activities is necessarily linked to, among other things, reliability of water supply and the level of prices received by the farmers for the main crop grown.

e) It is advantageous to have continuity of a technically strong team of Bank supervising staff as has occurred in this project.

Comments Received

WU1195
KOADC K24890
KOADC K24890

RE : PROJECT COMPLETION REPORT ON KOREA
OGSEO AREA DEVELOPMENT PROJECT PHASE I
(LOAN 1503-KO)

ATTN. : MR. GRAHAM DONALDSON

THANK YOU FOR YOUR LETTER OF SEPTEMBER 17, 1987.
WE ARE PLEASED TO INFORM YOU THAT WE READ THE BANK'S
REPORT CAREFULLY BUT COULDN'T FIND ANY INCONSISTENT
CONTENT ON THE ABOVE PROJECT COMPLETION REPORT.

REGARDS, SANG-WOOK HAN: EXECUTIVE DIRECTOR, ADC.

TO: 440098 WORLD BANK
OCT. 13, 1987

FOR MR. GRAHAM DONALDSON, CHIEF, OED
RE YR LET DATED SEPT. 17, 1987 CONCERNING OGSEO PCR (LOAN 1503KO).
WE ARE PLEASED TO INFORM YOU THAT WE FOUND THE PRESENT DRAFT OF
PCR SATISFACTORY N HAVE NO OTHER OPINION TO MAKE.
REGARDS. KYUNG-SOO SOHN, INT'L. DEPT.
NACF, SEOUL, KOREA

NACOF K32329

KOREA

[illegible] PROJECT STAGE I
(LOAN 1503-KO)

Projects Implemented by Agricultural Development Corporation Since Inception

Description	Name of Project	Financing Agency Loan Amount 1/	Estimated Cost (W billion)	Estimated Period	Actual Cost (W billion)	Actual Period	Area Proposed for Development (ha)	Actual Area Development (ha)	Estimated EIRR at Appraisal (%)	Estimated EIRR at Project Completion (%)	Status
Comprehensive Agricultural Development Project	1.Hongsong	IBRD (17,185)	10.2	1970-74	11.9	1970-75	12,140	12,140	15.0	16 2/	Completed
	2.Pyong Taek	IBRD (27,010)	16.7	1970-74	17.7	1970-77	18,419	18,419	13.0	13 2/	•
	3.Kyongju	IBRD (2,650)	3.5	1974-76	4.9	1974-77	1,140	1,140	11.9	11.9	•
	4.Yongsangang(I)	IBRD/IDA (40,137)	33.5	1972-78	51.3	1972-79	34,500	34,500	13.0	13 2/	•
	5.Kumkado	OECF (2,867)	3.2	1974-77	12.5	1974-79	2,500	2,500	17.9	13.5	•
	6.Chongyong	OECF (2,543)	9.8	1975-77	17.4	1975-81	2,600	2,269	14.2	15.0	•
	7.Injin	ADB (19,570)	22.1	1975-79	45.8	1975-83	8,166	7,185	14.2	11.8	•
	8.Haldongang	ADB (12,611)	17.4	1978-81	23.8	1978-84	4,400	3,668	16.3	15.8	•
	1.Yongsangang(II)	IBRD (95,680)	89.9	1978-83	197.9	1978-90	20,700	20,700	15.2	8 2/	Under Construction
	2.Hibachon	IBRD (20,996)	36.4	1977-81	101.0	1977-88	12,665	12,665	15.0	7 2/	•
	3.Keesan(Ryesu)	IBRD (36,000)	40	1978-82	82.9	1978-88	10,000	10,000	14.3	14.3	•
	4.Hongsong	ADB (25,544)	30	1977-81	61.9	1977-85	12,165	6,090	17.8	14.9	•
	5.Sapkyochon	OECF (8,735)	48.8	1975-79	102	1975-89	20,700	20,700	13.2	13.2	•
	6.Bocho	OECF (16,000)	127	1980-83	127	1980-89	7,700	7,700	13.0	13.0	•
	7.Kongsong(I)	-	84	1983-86	92.7	1983-89	-	-	12.9	12.9	•
River Irrigation Projects	1.Rural Infrastructure I	IBRD (20,000) 3/	29.9	1976-79	30.3	1976-80	13,500	12,000	13	8 2/	Completed
	2.Rural Infrastructure II	IBRD (52,922) 3/	66.6	1978-83	98.2	1978-85	9,200	9,245	12.7	10 2/	•

Source: Agricultural Development Corporation

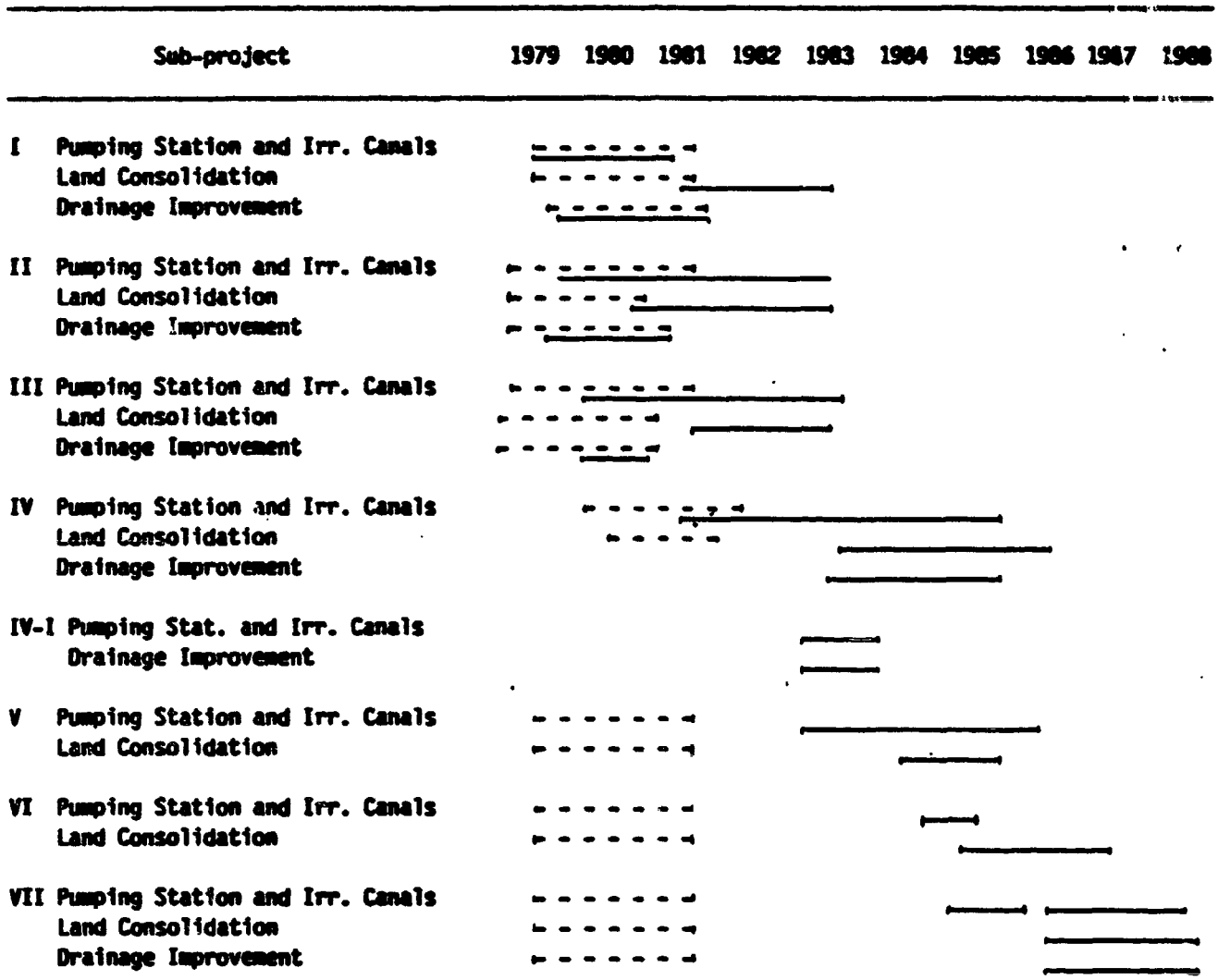
1/ ( ) : $,000; ( ) : Mill.Yen; Unit: Billion Won.
2/ As estimated in PCRs.
3/ Projects include irrigation as well as other components and loan amount for irrigation only indicated.

Table 1

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Implementation Schedule



Note: The Sub-project boundaries adopted do not coincide with those assumed in the SAR. For the purpose of this table it is assumed that the following correspond:

SAR		
Bonghwa	Subdivision	Sub-project II, III
Bugbu	Subdivision	Sub-project V, VI
Wangjeon	Subdivision	Sub-project I and VII
Nambu	Subdivision	Sub-project IV

- - - Indicate SAR proposals.
___ Indicate actual and assumed actual achievements.

Table 3

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Operation of Pumping Stations

Pumping Station Area Served Static Lift		Year	Hours	1,000m3	mm	MW/hr	Cost in Million Won	000'Won/ha
Seongdong	P	1983	3,050	19,640	510	497	11,145	2.9
3,854 ha		1984	5,456	23,600	610	891	19,957	5.2
6.25 m		1985	4,146	23,930	620	862	19,316	5.0
Bonghwa	S	1983	2,530	12,840	430	410	9,196	3.1
746/2,248 ha		1984	4,731	17,090	570	945	21,173	7.1
21.65/4.68 m		1985	4,916	17,535	590	988	22,127	7.4
Woogi	T	1983	665	620	260	45	1,021	4.2
243 ha		1984	1,121	1,000	410	78	1,761	7.2
17.36 m		1985	1,337	1,200	490	92	2,074	8.5
Shinwha	T	1983	2,609	1,700	540	51	1,160	3.7
115/201 ha		1984	2,444	1,640	520	104	2,343	7.4
16.3/0.65 m		1985	3,033	1,990	630	101	2,263	7.2
Yongsan	T	1983	207	40	80	3	69	1.4
49 ha		1984	2,011	390	800	30	675	13.8
11.75 m		1985	3,281	640	1,310	49	1,101	22.5
Jugbon	T	1983	99	28	40	2	49	0.6
77 ha		1984	1,982	570	740	44	993	12.9
11.2 m		1985	1,832	520	680	41	922	12.0
Tabjeong	P	1983	-	-	-	-	-	-
1,297/2,698 ha		1984	651	3,577		488	8,473	
28.9/27.3 m		1985	1,170	6,190		878	22,360	
Gayagog	S	1983	-	-	-	-	-	-
975 ha		1984	1,458	2,800	290	268	4,670	4.8
16.2 m		1985	2,152	4,333	440	396	10,880	11.2

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Drainage Pumping Stations

	Sub-Project	Catchment Area ha	Capacity m3/s	l/s/ha	Design Static Lift
Seongdong 1/	I	1,073	3.29	3.1	6.35
Weonbong	I	1,965	15	7.6	2.03
Chaewun	IV-I	3,179	32	10.1	4.05
Ganggyeong DPS 2/	IV	610	7	11.5	2.09
Bonghwa DPS	II	2,396	21	8.8	2.01
Changgu	VII	218	7	32.1	1.40
Duggi	VII	195	4.5	23.1	1.90
Changmaru	VII	64	1	15.6	1.50
Ganggyeong IPS	I-II	1,998	6.8	3.4	11.65
Sugjin	VI-VII	373.5	4.5	12.0	2.14

1/ Combined with irrigation PS.

2/ Separate from Ganggyeong irrigation pumping station at the mouth of Nonsan river

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE 1
(LOAN 1503 -KO)

Comparison of Appraisal Cost Estimates and Actual Costs up to 30.6.85

Expenditure Category	Appraisal Estimates 1/ Won (B)	Appraisal Estimates 1/ US$ (M)	Actual Costs up to 30.6.85 Won (B)	Actual Costs up to 30.6.85 US$ (M)	% Change over Appraisal Won (B)	% Change over Appraisal US$ (M)	Costs to Complete (July 85 to Dec. 88) Won (B)	Costs to Complete (July 85 to Dec. 88) US$ (M)
Civil Works								
New Irrigation								
Pumping station	3.4	7.0	1.4	1.8	(59)	(74)	0.4	0.4
Irrigation canals	7.7	15.8	8.3	10.6	8	(33)	8.0	9.0
Drainage canals	0.1	0.3	0.9	1.1	800	267	-	-
On-farm development	7.8	16.0	6.9	8.7	(12)	(46)	7.3	8.2
Sub-total	19.0	39.1	17.6	22.2	(8)	(43)	15.7	17.6
Existing Irrigation								
Pumping station	-	-	1.9	2.6	-	-	-	-
Irrigation improvement	0.3	0.7	1.8	2.4	500	243	-	-
Drainage improvement	2.3	4.8	2.1	3.0	(9)	(37)	0.2	0.2
Land consolidation	2.8	6.0	10.6	14.0	279	133	4.7	5.3
Sub-total	5.4	11.5	16.4	22.0	204	91	4.9	5.5
Sub-total Civil Works	24.4	50.6	33.9	44.2	39	(13)		
Equipment and Material								
Pumping station	2.4	5.1	6.4	8.5	167	67	0.7	0.7
Furnished material	1.8	3.7	5.3	7.1	194	92	1.7	2.0
Miscellaneous equipment	0.2	0.4	-	-	-	-	-	-
Sub-total	4.4	9.2	11.7	15.6	166	70	2.4	2.7
Other Expenditures								
Right of way	3.0	6.0	2.4	3.2	(20)	(47)	1.3	1.4
Consultants and training	0.3	0.6	0.2	0.2	(33)	(67)	-	-
Engineering & Admin.	4.7	9.6	6.8	9.5	45	(1)	2.7	3.1
Sub-total	8.0	16.2	9.4	12.9	18	(20)	4.0	4.5
Total Project Cost	36.8	76.0	55.0	72.7	49	(4)	27.0 2/	30.3 2/

1/ Physical contingencies (Won3.9 billion) and price contingencies (Won7.0 billion) allocated to individual items of expenditure.
2/ Final cost does not include physical contingencies (Won0.7 billion) and price contingencies (Won0.2 billion) estimated ADC for 1987.

Table 5

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503 -KO)

Comparative Statements of Appraisal and Final Cost Estimates

Expenditure Category	Unit	Appraisal Estimates 1/ Quantity	Appraisal Estimates 1/ Total Cost Won (B)	Appraisal Estimates 1/ Total Cost US$ (M)	Appraisal Estimates 1/ Unit Cost Won (M)	Appraisal Estimates 1/ Unit Cost US$ ('000)	Final Cost 2/ Quantity	Final Cost 2/ Total Cost Won (B)	Final Cost 2/ Total Cost US$ (M)	Final Cost 2/ Unit Cost Won (M)	Final Cost 2/ Unit Cost US$ ('000)	% Change Total Cost Won Based	% Change Total Cost Dollar Based	% Change Unit Cost Won Based	% Change Unit Cost Dollar Based
Civil Works															
New Irrigation															
Pumping station	No.	9+2 3/	3.4	7.0	309	636	10+3 3/	1.8	2.2	138	169	(47)	(69)	(55)	(73)
Irrigation canals	Km	190	7.7	15.8	41	83	264	16.3	19.6	62	74	112	124	51	(11)
Drainage canals	Km	60	0.1	0.3	1.7	5	33	0.9	1.1	27	33	800	267	1,488	560
On-farm development	ha	7,090	7.8	16.0	1.1	2.3	6,470	14.2	16.9	2	3	82	6	82	30
Sub-total		7,090	19.0	39.1	2.7	5.5	6,470	33.2	39.8	5	6	75	2	85	9
Existing Irrigation															
Pumping station	No.	-	-	-	-			1.9	2.6	271	371	-	-	-	-
Irrigation improvement	ha	3,710	0.3	0.7	0.1	0.2	1+6 3/	1.8	2.4	0.4	0.6	500	243	300	200
Drainage improvement	ha	2,500	2.3	4.8	0.9	1.9	4,330	2.3	3.2	0.9	1.3	-	(33)	-	(32)
Land consolidation	ha	2,770	2.8	6.0	1.0	2.2	2,937	15.3	19.3	5.2	6.6	446	222	420	200
Sub-total		3,710	5.4	11.5	1.5	3.1	4,330	21.3	27.5	4.9	6.4	294	139	227	106
Sub-total Civil Works	ha	10,800	24.4	50.6	2.3	4.7	10,800	54.5	67.3	5.0	6.2	123	33	117	32
Equipment and Material															
Pumping station	No.	9+2 3/	2.4	5.1	218	464	20	7.1	9.2	355	460	1,96	80	63	(1)
Furnished materials	-	-	1.8	3.7	-	-	-	7.0	9.1	-	-	289	146	-	-
Miscellaneous equipment	-	-	0.2	0.4	-	-		-	-	-	-	-	-		
Sub-total			4.4	9.2	-	-	-	14.1	18.3	-	-	220	99		
Other Expenditures															
Right of way			3.0	6.0				3.7,	4.6			23	(23)		
Consultants and training			0.3	0.6				0.2	0.2			(33)	(67)		
Engineering & Admin.			4.7	9.6				9.5	12.6			102	31		
Sub-total			8.0	16.2				13.4	17.4			68	7		
Total Project Cost	ha	10,800	36.8	76.0	3.4	7.0	10,800	82.0	103.0	7.6	9.5	123	36	124	36

1/ Physical contingencies (Won3.9 billion) and price contingencies (Won7.0 billion) allocated to individual items of expenditure.
2/ Final cost does not include physical contingencies (Won0.7 billion) and price contingencies (Won0.2 billion) estimated by ADC for 1987.
3/ Drainage pumping station (Sungdeong) which is for both drainage and irrigation is counted only as one.

Table 6

Table 7

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Contract Status of Sub-Projects
(Won million)

	Original Contract Amount (A)	Revised Contract Amount (B)	Balance (C) (B-A)	Price Escalation	Design Modification
I.	5,671	8,192	2,521	1,892	629
Pumping stations	1,262	1,557	295	62	233
Irrigation canals	804	1,253	449	311	138
Land consolidation	3,130	4,655	1,525	1,366	159
Drainage improvement	475	727	252	153	99
II.	3,495	6,259	2,764	1,307	1,457
Pumping stations	134	644	510	10	500
Irrigation canals	34	62	28	15	13
Land consolidation	2,968	4,744	1,776	1,190	586
Drainage improvement	359	809	450	92	358
III.	4,098	6,725	2,627	1,299	1,328
Pumping stations	1,293	1,680	387	117	270
Irrigation canals	1,169	2,005	836	434	402
Land consolidation	1,525	2,775	1,250	701	549
Drainage improvement	111	265	154	47	107
IV.	9,501	10,843	1,342	1,066	276
Pumping stations	3,507	3,806	299	108	191
Irrigation canals	2,898	3,361	463	381	82
Land consolidation	2,213	2,795	582	421	161
Drainage improvement	883	881	(2)	156	(158)
IV-1	1,642	1,639	(3)	-	(3)
Pumping stations	1,395	1,392	(3)	-	(3)
Drainage improvement	247	247	-	-	-
V.	5,415	5,800	385	130	255
Pumping stations	348	396	48	2	46
Irrigation canals	3,820	3,908	88	84	4
Land consolidation	1,247	1,496	249	44	205
VI.	7,284	7,267	(17)	-	(17)
Pumping stations	417	429	12	-	12
Irrigation canals	4,153	4,092	(61)	-	(61)
Land consolidation	2,714	2,746	32	-	32
VII.	8,177	8,204	27	-	27
Pumping stations	937	937	-	-	-
Irrigation canals	4,393	4,420	27	-	27
Land consolidation	2,847	2,847	-	-	-
Total	45,283	54,929	9,646 (100%)	= 5,694 (59%)	+ 3,952 (41%)

Source: ADC.

Table 8

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Loan Disbursements
(US$ Million)

Bank Fiscal Year	Appraisal Estimates Annual	Appraisal Estimates Cumulative	Actual Disbursements Annual	Actual Disbursements Cumulative	Actual as % of Appraisal Estimates Annual	Actual as % of Appraisal Estimates Cumulative
1979	1.0	1.0	-	-	-	-
1980	6.8	7.8	0.65	0.65	10	8
1981	13.4	20.2	4.55	5.20	34	26
1982	9.7	29.9	5.70	10.90	59	36
1983	5.1	36.0	7.17	18.07	141	50
1984	-	36.0	7.43	25.50	-	71
1985	-	36.0	8.40	33.90	-	94
1986	-	36.0	2.10	36.00	-	100

Table 9

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Loan Allocations
(US$ Million)

Category of Expenditure	Original Allocation	%	Revised 1/ Allocation	Final Allocation	%
Civil works 2/	23.0	64	21.7	22.1	61
Equipment and materials	6.8	19	14.0	13.7	38
Consultants' Services and training	0.4	1	0.3	0.2	1
Unallocated	5.8	16	-	-	-
Total	36.0	100	36.0	36.0	100

1/ Bank's letter dated 22 November 1982.

2/ Original 50% increased to 65% on 16.6.1980 and reverted to 50% on 11.2.1982.

Table 10

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Comparative Balance Sheets of ADC

	Year Ended 31 December			
	1982	1983	1984	1985
	(W billion)			
Assets				
Property and equipment (net)	10.2	9.9	10.7	11.0
Investments	8.9	13.3	9.0	10.0
Contracts in progress	448.1	500.0	575.5	696.4
Current assets	36.7	42.1	37.7	29.8
Other assets	0.1	0.2	8.9	11.4
Total Assets	504.0	565.5	641.8	758.6
Capital and Liabilities				
Paid-in capital	9.6	9.6	9.6	9.6
Capital surplus	0.2	0.2	0.3	0.3
Retained earnings 1/	2.6	4.6	6.1	6.7
Net worth	12.4	14.4	16.0	16.6
Long-term debt	185.0	197.9	191.0	247.0
Advances from the Government	249.7	288.1	369.0	431.0
Other long-term liabilities	5.1	7.0	10.5	10.2
Employees' severance liability	16.3	18.6	19.8	22.1
Current liabilities	35.5	39.5	35.5	31.7
Total Capital and Liabilities	504.0	565.5	641.8	758.6
Current assets/current liabilities	1:1	1:1	1.3:1	0.9:1
Long-term debt/equity & long-term debt	94%	93%	92%	94%
Advances from Govt./long-term funds	53%	56%	63%	64%

Source: ADC's audited financial statements.

1/ Retained earnings made up of:

Legal reserve	2.6	4.6	4.8	4.8
Dividends (proposed)	-	-	1.3	1.9
	2.6	4.6	6.1	6.7

No transfers to legal reserve is made after 1984 since it has reached the statutory limit of 50% of paid-in capital.

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Comparative Statement of Earnings and Retained Earnings of ADC

	Year Ended 31 December			
	1982	1983	1984	1985
	(W billion)			
Earned revenues	134.2	125.7	122.6	109.8
Cost of earned revenues	131.0	122.1	120.7	108.0
Gross profit	3.2	3.6	1.9	1.8
General administrative expenses	2.2	2.0	1.9	1.7
Operating profit	1.0	1.6	-	0.1
Interest income	0.6	0.8	0.73	1.0
Gains from sale of property & equip.	0.6	0.4	0.05	0.03
Miscellaneous income	0.6	0.5	0.88	0.98
Earnings before taxes & special loss	2.8	3.3	1.7	2.1
Special loss (severance liability associated with prior year)	1.7	0.9	-	-
Earnings before taxes	1.1	2.4	1.7	2.1
Income taxes	0.6	0.5	0.1	0.2
Earnings after taxes	0.5	1.9	1.6	1.9
Retained earnings at beginning of the year	2.1	2.6	4.5	6.1
Retained earnings at end of the year	2.6	4.5	6.1	6.7
made up as				
Legal reserve	2.6	4.5	4.8	4.8 1/
Dividends proposed	-	-	1.3	1.9
Earnings after tax/equity	4%	13%	9%	12%
Operating profit/operating assets	0.2%	0.3%	-	0.01%

Source: ADC's audited financial statements.

1/ No transfers to legal reserve is made after 1984 since it has reached the statutory limit which is 50% (W4.8 billion) of the paid-in capital (W9.6 billion).

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503 -KO)

Technical Assistance and Training

Technical Assistance	Appraisal	Actual
Project implementation (man-months)	18	15 1/
Preparation of feasibility studies (man-months)	15	-
Total Cost (US$).	184,000	199,353 2/

Training	Category of Staff	Numbers Trained	Subject of Training	Period of Training	Place of Training
1983	Civil Engineers	7	Hydrology	6 - 11 months	U.S.A. (USBR, Colorado State University)
1984	Civil Engineers	10	Water Management	2 - 3 weeks	U.S.A. (USBR, Taiwan ROC - "AATSC")
1985	Civil Engineers	3	Irrigation & Drainage	2 - 3 weeks	Chile-ICID & Other Nations
Total		20			

USBR = United States Bureau of Reclamation
ROC = Republic of China
AATSC = Asign Agricultural Tecnical Service Center
ICID = International Committee for Irrigation and Drainage

Source. Agricultural Development Corporation.

1/ 8 m/m by Sanyu consultants providing expertise of irrigation, drainage and mechanical engineer. Contract signed in April 1979. 7m/m by Louis Berger providing expertise of hydrologist, dam engineer and O & M specialist. Contract signed in April 1979.

2/ US$41,500 for consultants and the balance US$157,853 used to meet training cost.

Table 12

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Progress of Farm Input Use in Project Area

	1978	1979	1980	1981	1982	1983	1984	1985
Farm Machinery (nos.)								
Power-tillers	1,785	2,003	2,287	2,654	3,104	3,956	3,956	3,975
Tractors	24	32	45	61	80	139	139	139
Combine harvestor	1	3	8	13	30	116	116	116
Binders	44	70	97	106	124	117	117	136
Transplanter	6	26	169	204	264	371	371	390
Power sprayer	501	608	897	1,108	1,440	2,495	2,495	2,757
Fertilizer Sales (MT)								
Nitrogen (N)	4,751	4,561	3,691	4,829	3,548	4,601	4,570	4,550
Phosphate (P)	1,696	1,539	1,497	2,888	1,625	2,049	1,629	1,980
Potassium (K)	1,572	1,296	1,819	2,416	1,841	2,332	1,375	1,850
Agricultural Chemical (MT)								
Insecticide	100.0	150.9	114.5	108.9	113.5	106.9	108.0	114.6
Herbicide	18.7	26.3	20.8	9.6	19.9	18.8	21.0	21.4

Source: Nonsan Country Yearbook.

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503 -KO)

Agricultural Credit Use in Project Area
(Won Million)

	1978	1979	1980	1981	1982	1983	1984	1985
Short-Term Loans								
No. of borrowers	14,220	16,702	17,054	14,918	14,557	15,499	16,128	16,040
Amount granted	3,997	5,037	6,833	9,982	9,974	11,549	13,539	14,964
Amount repaid	3,557	4,482	6,288	8,485	8,681	9,816	11,508	12,569
Amount in arrears	440	555	545	1,497	1,073	1,733	2,031	2,395
No. of borrowers in arrears	1,564	1,837	1,364	2,238	1,600	2,325	2,420	2,528
Medium & Long-Term Loans								
No. of borrowers	4,741	2,278	2,326	1,298	2,569	2,317	1,792	1,984
Amount granted	705	622	932	868	1,721	1,726	1,504	1,849
Amount repaid	627	566	857	825	1,549	1,536	1,279	1,554
Amount in arrears	78	56	75	43	172	190	225	295
No. of borrowers in arrears	522	205	186	65	256	255	268	317

Source: Nonsan Gun.

Table 14

KOREA

OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503 -KO)

Farmers' Organizations in the Project Area

Year	Haung Nong Gye (FLIA)		Haung Nong Gye (ADC)		Total		Agricultural Cooperatives	
	Number	Members	Number	Members	Number	Members	Number	Members
1978	257	13,949	-	-	257	13,949	16	22,998
1979	252	13,252	-	-	252	13,252	16	22,872
1980	252	13,274	-	-	252	13,274	15	23,220
1981	261	13,392	41	2,165	302	15,557	15	24,981
1982	255	13,868	79	4,171	334	18,039	15	25,458
1983	265	14,128	113	5,966	378	20,094	15	25,220
1984	262	14,128	147	7,761	409	21,889	15	25,220
1985	271	13,519	147	7,761	418	21,235	15	25,220

Source: ADC

Table 15

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Status of Covenants

Covenant	Subject	Deadline	Status
Loan Agreement			
Section 3.03	Study of alternative location of pumping stations.	06/30/78	Completed.
Section 3.04	Operating rules for Tabjeong Reservoir.	12/31/82	Operation and maintenance guidelines for Tabjeong reservoir have been prepared.
Section 3.05(a)	Set up Ogseo Project Office.	02/01/78 1/	Completed.
Section 3.05(b)	Ogseo Project Office to be operating at Nonsan.	07/01/78	Completed.
Section 3.06	Plan for operation and maintenance.	12/31/79	No action by ADC; O & M are being taken care of by FLIA.
Section 3.08(c)	Project completion report.	12/31/85	Basic data for PCR have been supplied.
Section 5.02	Accounts and audits.	04/30 annually	Up to date including 1985 accounts.
Guarantee Agreement			
Section 3.02	Government guarantee of releases from Daechong dam to prevent salt water intrusion.	None	Guarantee has not been given but salt intrusion has not been reported. ADC will request MAF to pursue this matter.
Section 3.03	Safety of dams.	06/30/79	Detailed guidelines for arrangements for inspection of dams have been prepared.
Section 3.04	Cost recovery	On completion of irrigation works.	Cost recovery being effected on completed subprojects

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Appraised and Revised Land Development Plan

	Pre-Project Land Use							
	Irrigated Paddylands		Rainfed Paddylands	Rainfed Uplands	Forest	Total		
	Consolidated	Non-Consolidated						
	(ha)							
Appraised Land Development Plan								
Land Consolidation	-	2,770	3,070	-	-	5,840		
Drainage Improvement	940	(1,560) 1/	-	-	-	940 2/		
On-Farm Development (Tertiary/ drainage)	-	-	2,240 3/	-	-	2,240		
Land Conversion	-	-	-	1,510	270	1,780		
Total	940	2,770	5,310	1,510	270	10,800		
							Completed as of End 85	Balance
Revised Land Development Plan								
Land Consolidation	-	2,937	1,866	-	-	4,803	3,055	1,748
Drainage Improvement	1,393	(1,135) 4/	(207) 5/	-	-	1,393 6/	1,243	150
On-Farm Development (Tertiary/ drainage)	-	-	3,865 7/	-	-	3,865	942	2,923
Land Conversion	-	-	-	739	-	739	42	697
Total	1,393	2,937	5,731	739	-	10,800	5,282	5,518

Source: Agricultural Development Corporation.

1/ Included in 2,770 ha of the existing irrigated paddyland to be consolidated; 1,560 ha out of 2,770 ha would receive drainage improvement as well as land consolidation.

2/ Excludes 1,560 ha (see footnote 1/ above).

3/ Includes 980 ha of partially irrigated paddyland.

4/ Included in 2,937 ha to be consolidated.

5/ Included in 3,865 ha to be developed.

6/ Excludes 1,135 ha and 207 ha (see footnotes 4/ and 5/.

7/ Includes 1,230 ha of partially irrigated paddyland.

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Land Use - Appraisal Projection and Actual Changes

	Appraisal		Actual						Anticipated Completion
	1977 (Pre-Project)	1982 (Completion)	1980 (Pre-Project)	1981	1982	1983	1984	1985	1988
	(ha)		(ha)						
Paddyland									
Irrigated (without consolidation)	2,770	4,020	2,937	2,612	1,983	2,045	2,012	2,056	4,604
Irrigated (consolidated)	940 1/	6,780	1,393 1/	1,914	2,945	3,380	3,980	4,448	6,196
Rainfed	5,310 2/	-	5,731 3/	5,535	5,133	4,678	4,111	3,599	-
(Total paddyland)	(9,020)	(10,800)	(10,061)	(10,061)	(10,061)	(10,103)	(10,103)	(10,103)	(10,800)
Rainfed Upland	1,510	-	739	739	739	697	697	697	-
Forest	270	-	-	-	-	-	-	-	-
Total	10,800		10,800						

Source: SAR and ADC.

1/ Consolidated paddyland subject to seasonal flooding.

2/ Includes 980 ha of partially irrigated area.

3/ Includes 1,230 ha of partially irrigated area.

Table 18

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Cropped Area, Cropping Intensity and Production - Appraisal Projection and Actual Achievements

	Appraisal		Actual					
	1977 (Pre-project)	1986 (Full development)	1980 (Pre-project)	1981	1982	1983	1984	1985
	(ha)		(ha)					
Cropped Area								
Irrigated Rice:								
- HYV (consolidated)	470	4,750	670	815	1,155	1,330	1,470	1,820
- TRV (consolidated)	470	2,030	725	1,300	1,790	2,050	2,510	2,825
- HYV (non-consolidated)	1,385	3,220	1,400	835	830	820	665	655
- TRV (non-consolidated)	1,385	800	1,540	1,775	1,150	1,225	1,350	1,400
Rainfed Rice:								
- HYV	1,700	-	2,750	1,385	1,540	1,870	1,450	1,150
- TRV	3,610	-	2,980	4,150	3,595	2,810	2,660	2,450
(Total Rice)	(9,020)	(10,800)	(10,065)	(10,060)	(10,060)	(10,105)	(10,105)	(10,100)
Upland Crops:								
- Barley	3,140	7,160	510	815	1,010	1,235	1,380	1,670
- Soybeans	500	-	590	590	590	550	550	550
- Vegetables	1,010	-	-	-	-	-	-	-
- Strawberries	-	-	60	280	425	585	710	880
- Garlic	-	-	-	100	165	210	285	345
- Red pepper	-	-	150	145	150	140	140	140
Total Cropped Area (ha)	13,670	17,960	11,375	11,990	12,400	12,825	13,170	13,685
Cropping Intensity (%)	130 1/	166 2/	105 2/	111 2/	115 2/	119 2/	122 2/	127 2/
Production	(tons)		(tons)					
Irrigated Rice	13,200	52,200	16,130	20,200	23,000	25,780	29,530	31,580
Rainfed Rice	16,600	-	18,290	17,430	17,350	16,560	15,380	12,450
(Total Rice)	(29,800)	(52,200)	(34,420)	(37,630)	(40,350)	(42,340)	(44,910)	(44,030)
Barley	6,100	21,000	970	1,630	2,130	2,600	3,040	3,840
Soybeans	500	-	940	940	940	880	880	880
Vegetables	14,100	-	-	-	-	-	-	-
Strawberries	-	-	370	1,700	2,640	3,630	4,390	5,490
Garlic	-	-	-	530	1,000	1,360	1,920	2,390
Red pepper	-	-	150	150	150	140	140	140

Source: SAR and ADC.

1/ Based on net cultivated area of 10,430 ha, excluding 270 ha of forest.

2/ Based on net cultivated area of 10,800 ha.

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Crop Yields - Appraisal Estimates and Actual Achievements

	Pre-Project						Future with Project					
	Appraisal (1977)			Actual (1980) 1/			Appraisal (1986) 2/			Actual (1985) 3/		
	R 4/	NC 4/	CF 4/	R	NC	CF	R	NC	C 4/	R	NC	C
	(tons/ha)											
Traditional rice 5/	3.0	3.4	3.6	3.0	3.6	3.4	-	4.2	4.7	3.3	4.3	4.8
HYV rice 5/	3.4	3.6	4.0	3.4	4.0	3.8	-	4.7	5.2	3.8	5.0	5.5
Barley 5/	1.8	2.0	2.2	1.8	2.0	1.8	-	2.8	3.0	1.8	2.5	2.5
Soybeans	1.0	-	-	1.0	-	-	-	-	-	1.0	-	-
Garlic	5.5	-	-	-	-	-	-	-	-	-	6.9	6.9
Red pepper	1.2	-	-	1.2	-	-	-	-	-	1.2	-	-
Strawberries	-	-	-	-	6.0	-	-	-	-	-	6.2	6.2

Source: Staff Appraisal Report (1977) and ADC data.

1/ Actual crop development due to the project has taken place from 1981.

2/ The project was expected to reach full development in 1986.

3/ Appraisal yield projection for 1985 is not given in SAR.

4/ R = Rainfed; NC = Irrigated (non-consolidated); CF = Irrigated (consolidated but subject to seasonal flooding); C = Irrigated (consolidated).

5/ All rice and barley yields are on polished basis.

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DESERT AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Past 8 Years Cereal Crop Statistics in Hwasan Gun (County)

Hwasan - County	1977			1978			1979			1980			1981			1982			1983			1984		
	CA 1/ ('000 ha)	Y 2/ (tons/ ha)	P 3/ ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)	CA ('000 ha)	Y (tons/ ha)	P ('000 tons)
Rice																								
Irrigated - MYV	10.4	4.8	49.9	10.4	4.8	50.0	8.5	4.6	39.1	6.0	3.7	22.2	3.9	4.7	18.3	5.7	4.8	27.4	5.3	4.9	25.9	4.9	5.1	24.9
Irrigated - TVR	1.7	4.2	7.1	1.7	4.3	7.3	4.0	4.3	17.2	4.5	3.4	22.1	0.3	4.1	34.8	7.0	4.4	30.3	8.6	4.5	34.8	9.1	4.7	42.3
Rainfed - MYV	4.0	3.9	10.2	4.2	4.3	10.8	3.0	3.0	14.5	2.1	3.9	7.5	1.9	3.9	7.0	1.9	3.9	7.5	2.5	3.1	8.2	1.5	3.1	5.1
Rainfed - TVR	0.8	3.4	2.7	0.8	3.5	2.8	1.8	3.5	6.3	2.8	2.4	6.7	3.9	3.4	13.1	2.7	3.4	9.2	3.1	3.6	11.1	2.8	3.6	10.1
(Total rice)	(17.7)	(4.4)	(78.2)	(17.6)	(4.5)	(78.9)	(18.1)	(4.3)	(77.4)	(17.9)	(3.3)	(58.5)	(10.0)	(4.1)	(73.0)	(18.1)	(4.3)	(78.5)	(18.4)	(4.4)	(81.2)	(18.2)	(4.6)	(83.4)
Barley	1.6	2.8	3.2	2.0	2.0	4.0	1.6	2.2	3.5	1.8	1.8	3.2	1.7	2.3	3.9	1.4	2.4	3.4	1.6	2.4	3.8	1.4	2.4	3.3
Others 4/	1.0	6.1	6.1	1.0	6.1	6.1	1.0	6.1	6.1	1.1	6.0	6.6	1.1	6.2	6.8	1.4	6.2	8.7	1.5	6.3	9.5	1.9	6.3	11.9
- Total Cropped Area	20.1	-	-	20.6	-	-	20.7	-	-	20.8	-	-	20.8	-	-	20.9	-	-	21.5	-	-	21.5	-	-
- Net Cultivated Area	17.6	-	-	17.8	-	-	17.9	-	-	17.9	-	-	18.0	-	-	18.2	-	-	18.3	-	-	18.3	-	-
- Cropping Intensity (%)	115	-	-	116	-	-	115	-	-	116	-	-	116	-	-	114	-	-	117	-	-	118	-	-

Source: Hwasan County Yearbook.

1/ CA = Cropped area; figures rounded to nearest 100 ha.

2/ Y = Yield.

3/ P = Production; figures rounded to nearest 100 tons.

4/ Main crops are strawberries, tomatoes and cucumber; yield and production are represented by strawberries.

Table 21

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Farm Budget for an Average 0.8 ha Holding

	Pre-Project			Future Without Project			Future With Project		
	Cropped Area (ha)	Yield (t/ha)	Value (W'000)	Cropped Area (ha)	Yield (t/ha)	Value (W'000)	Cropped Area (ha)	Yield (t/ha)	Value (W'000)
Value of Production (0.5 ha) 1/									
Rice - rainfed TRV	0.15	3.0	372.2	0.20	3.3	545.8	-	-	-
- rainfed HYV	0.15	3.4	358.5	0.10	3.8	267.1	-	-	-
- irrigated (NC) TRV	0.08	3.6	238.2	0.10	4.0	330.8	0.2	4.3	711.2
- irrigated (NC) HYV	0.07	4.0	196.8	0.05	4.5	158.2	0.1	5.0	351.5
- irrigated (C/F) TRV	0.03	3.4	84.4	0.03	3.8	89.3	-	-	-
- irrigated (C/F) HYV	0.02	3.8	53.4	0.02	4.1	57.6	-	-	-
- irrigated (C) TRV	-	-	-	-	-	-	0.15	4.8	595.4
- irrigated (C) HYV	-	-	-	-	-	-	0.05	5.5	193.3
Barley	0.01	1.9	8.4	0.04	2.1	37.0	0.08	2.9	102.3
Strawberry 2/	-	-	-	0.04	6.5	241.8	0.07	6.5	423.1
By product 3/	-	-	121.6	-	-	142.0	-	-	185.6
Total	0.51	-	1,433.5	0.58	-	1,869.6	0.65	-	2,562.4
Cropping Intensity									
Production cost 4/	-	-	497.7	-	-	600.9	-	-	733.6
Water charges 5/	-	-	22.0	-	-	22.0	-	-	55.0
Taxes 6/	-	-	28.7	-	-	37.4	-	-	51.2
Total Cost	-	-	548.4	-	-	660.3	-	-	839.8
Net farm income from the 0.5 ha (inside project area)	-	-	885.1	-	-	1,209.3	-	-	1,722.6
Income from 0.3 ha (outside the project area) 7/	-	-	265.5	-	-	265.5	-	-	265.5
Total Incomes	-	-	1,150.6	-	-	1,474.8	-	-	1,988.1

1/ Farm area benefited from the project works; upland conversion area was not taken into account in the cropping pattern, as the area is less than 10% of total project area.
2/ Strawberry used to represent other high value horticulture crops.
3/ From rice and barley.
4/ Based on crop budgets shown in Table 23 and prices shown in Table 24.
5/ At W110,000 per ha.
6/ 2% of gross value of production.
7/ 70% of agricultural income is assumed to come from inside the project area.

Table 22

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OGSEO AREA DEVELOPMENT PROJECT STAGE 1
(LOAN 1503-KO)

Per Hectare Cost of Crop Production 1/

		Physical Inputs							Total Cost per Ha 2/	
		Seed	Fertilizers				Labour			
			N	P	K	Compost	Hired	Family	Financial	Economic
		(kg)	(kg)			(tons)	man-days		(W'000)	
Rice:										
rainfed - TRV	- P*	45	100	50	40	11.0	33	92	1,819.3	1,185.7
	- WO*	45	110	55	45	10.0	30	90	2,031.7	1,209.1
rainfed HYV	- P	50	115	60	60	11.0	40	89	1,584.9	1,250.4
	- WO	50	120	65	65	10.0	42	87	1,905.8	1,307.3
irrigated - TRV (NC)	- P	45	110	65	65	11.0	36	92	2,275.0	1,248.5
	- WO	45	115	70	70	10.0	30	83	2,625.3	1,208.2
	- WP*	45	120	70	80	10.0	30	83	2,848.0	1,214.8
irrigated - HYV (NC)	- P	50	130	70	70	11.0	39	86	1,992.0	1,144.5
	- WO	50	140	75	75	10.0	39	87	2,302.8	1,191.4
	- WP	50	145	80	70	10.0	32	86	2,705.0	1,666.1
irrigated - TRV (CF)	- P	45	110	60	60	11.0	34	90	2,116.1	1,225.3
	- WO	45	115	65	65	10.0	28	90	2,337.5	1,225.5
irrigated - HYV (CF)	- P	50	130	65	60	11.0	38	85	1,848.5	1,268.1
	- WO	50	135	70	60	10.0	39	86	2,053.2	1,281.1
irrigated - TRV (C)	- WP	45	125	70	80	10.0	30	83	2,848.0	1,214.8
irrigated - HYV (C)	- WP	50	150	90	110	10.0	23	86	3,073.0	1,426.4
Barley -	- P	100	100	60	50	6.0	18	85	326.6	842.2
	- WO	110	115	65	55	6.0	18	85	388.1	880.0
	- WP	130	120	80	70	6.0	16	85	690.6	940.0
Strawberry	- P	6,000 3/	80	70	70	6.0	110	120	3,721.6	2,037.6
	- WO	6,000 3/	80	80	70	9.0	120	120	4,021.0	2,147.6
	- WP	6,000 3/	80	80	70	9.0	120	120	4,021.0	2,147.6
Garlic	- WO	670 4/	250	200	200	9.0	47	120	3,474.9	5,667.2
	- WP	670 4/	250	200	200	9.0	47	120	3,474.9	5,667.2
Soyabean	- P	63	40	60	50	5.0	16	98	903.5	803.1
	- WO	63	40	65	55	5.5	17	98	965.2	811.2
Red pepper	- P	19 5/	250	190	210	13.0	55	170	2,133.4	2,377.9
	- WO	19 5/	250	195	215	14.0	55	170	2,496.7	2,381.5

P = Pre-project; WO = Future without project; WP = Future with project.

/ Based on ADC estimate.
/ Includes also costs of agro-chemicals, land preparation (draught animals/mechanization), other materials such as plastic sheets, frames, poles for rice nursery and hot-house for strawberry and threshing/milling.
/ No. of seedlings.
/ Per 100 bulbs.
/ Per deci-litre.

Table 24

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Farm Output and Input Prices

Outputs	Financial (W/kg)	Economic (W/kg)
Rice - traditional variety	827 1/	400 2/
- HYV	703 1/	400 2/
Barley	441	200 3/
Red pepper (dried)	3,934	3,698
Garlic	1,278	1,201
Soyabean	792	274
Strawberry	930	884
Inputs		
Fertilizers - Nitrogen	503	426 2/
- Phosphate	468	263 2/
- Potassium	143	250 2/
- Compost	12	11
Seed - paddy	671	631
- barley	421	356
- red pepper (per dl.)	18,060	16,980
- garlic (per 100 bulbs)	6,616	6,219
- soyabean	932	876
- strawberry (per seedling)	50	47
Farm labour (per man-day) - male 4/	9,000	5,760
- female 4/	7,000	4,480

1/ Average of 5 years (1981-85).
2/ See Table 26.
3/ 85% of border price of wheat.
4/ On average 75% male and 25% female labour used.

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OCSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Investment Costs in Economic Terms
(W Million)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Annual financial expenditure 1/	498	625	4,036	11,146	11,433	11,986	10,565	8,516	8,188	8,888	7,273
Wholesale price index (1985 = 100)	47.2	56.8	78.1	93.5	98.8	98.8	99.8	100.8			
Annual expenditure in 1985 prices	1,043	1,188	5,168	11,921	11,666	12,149	10,672	8,516	8,188	8,888	7,273
Annual expenditure in economic terms 2/	834	888	4,134	9,537	9,333	9,719	8,538	6,813	6,488	7,848	5,818

1/ Based on data provided by ADC.

2/ Exclude transfer payments, rights of way and interest; however value of production foregone on land for right of way has been included in project benefit as a negative flow based on "without project" production. Specific and standard conversion factors used to derive economic values are similar to those used in Niho and Yong San Gang Projects PCRS.

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Computation of Economic Prices (Projected 1990 Price in Constant 1985 Terms)

	Rice	Wheat	Urea 1/	TSP 1/	MOP 3/
			(US$/MT)		
Projected 1990 price in 1985 constant $ 1/	346	156	255	173	102
Ocean freight and insurance	35	35			20
CIF Inchon/Pusan	381	191	255	173	122
			(Won/MT)		
CIF Inchon/Pusan 4/	333,375	167,125	223,125	151,375	106,750
Inland transportation, handling storage 5/	70,860	70,860	(35,500)	(35,500)	37,400
Price in project area	404,235	237,985	187,625	115,875	144,150
Farm to market transportation 6/	(5,400)	(5,400)	5,400	5,400	5,400
Farmgate price	398,835	232,585	193,025	121,175	149,550
Farmgate Price per kg	400	233	193	121	150

Source: World Bank Commodity Price Forecasts, January 1985; adjusted by Manufacturing Unit Value Index to obtain price in 1985 constant terms. Export parity prices for Urea & TSP; import parity prices for all others.

1/ 46% Nitrogen
2/ 46% Phosphate
3/ 60% Potassium
4/ Converted at the current rate of exchange of US$1 = Won 875.
5/ Based on financial costs adjusted using SCF of 0.94.

Table 26

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OGSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1505-KO)

Cropped Area, Yield and Production Used for Analysis

	Pre-Project 1/			Future Without Project 2/			Future With Project 3/		
	Cropped Area (ha)	Yield (t/ha)	Prod. (tons)	Cropped Area (ha)	Yield (t/ha)	Prod. (tons)	Cropped Area (ha)	Yield (t/ha)	Prod. (tons)
Rice - rainfed HVV	2,750	3.4	9,350	1,830	3.8	6,950	-	-	-
- rainfed TRV	2,980	3.0	8,940	3,900	3.3	12,870	-	-	-
- irrigated (NC) HVV	1,400	4.0	5,600	940	4.5	4,230	1,610	5.0	8,050
- irrigated (NC) TRV	1,540	3.6	5,540	2,000	4.0	8,000	2,995	4.3	12,880
- irrigated (C/F) HVV	670	3.8	2,545	490	4.1	2,010	-	-	-
- irrigated (C/F) TRV	725	3.4	2,465	905	3.6	3,260	-	-	-
- irrigated (C) HVV	-	-	-	-	-	-	2,170	5.5	11,935
- irrigated (C) TRV	-	-	-	-	-	-	4,025	4.8	19,320
Barley	510	1.9 4/	970	1,080	2.1 4/	2,270	2,160	2.9	6,265
Strawberry	60	6.0	180	500	6.5	3,250	970	6.5	6,305
Garlic	-	-	-	180	7.0	1,260	370	7.0	2,590
Soyabean	590	1.6	945	540	1.7	915	-	-	-
Red pepper	150	1.0	150	200	1.1	220	-	-	-
Total Cropped Area (ha)	11,375			12,565			14,300	-	-
Total Cultivated Area (ha)	10,800			10,800			10,800	-	-
Cropping Intensity (%)	105			116			132	-	-

Note NC = Non consolidated; C/F = Consolidated-flooded; C = Consolidated.

1/ 1980.
2/ 1997 onwards.
3/ 1981 onwards.
4/ Average yield.

Table 27

KOREA

OCSEO AREA DEVELOPMENT PROJECT STAGE I
(LOAN 1503-KO)

Economic Analysis
(W Million)

Year	Investment Cost 1/	Paddy Conversion 2/	O & M	Without Project	With Project	Incremental Benefits	Foregone production on 200 ha 4/	Net Benefits
1978	834	-	-		-	-	-	(834)
1979	888	-	-		-	-	30	(918)
1980	4,134	-	-	2,570	2,570	-	30	(4,172)
1981	9,537	-	13	2,912	4,852	1,940	30	(7,648)
1982	9,333	-	13	3,283	6,531	3,320	54	(6,072)
1983	9,719	53	13	3,494	7,814	4,320	54	(5,519)
1984	8,538	-	534	3,785	9,542	5,757	68	(3,383)
1985	6,813	-	598	4,076	9,832	5,756	81	(1,728)
1986	6,488	151	786	4,368	10,841	6,473	81	(1,825)
1987	7,848	141	924	4,659	11,082	6,423	108	(1,790)
1988	5,818	153	1,148	4,775	12,370	7,595	108	368
1989	-	141	1,159	4,892	12,577	7,685	108	6,277
1990	-	147	1,169	5,008	12,811	7,803	108	6,379
1991	-	159	1,182	5,125	12,931	7,806	108	6,357
1992	-	-	1,182	5,241	12,931	7,690	108	6,400
1993	-	-	1,182	5,358	12,931	7,573	108	6,283
1994	-	-	1,182	5,474	12,931	7,457	108	6,167
1995	-	-	1,182	5,590	12,931	7,341	108	6,051
1996	-	-	1,182	5,707	12,931	7,224	108	5,934
1997	4,500 3/	-	1,182	5,823	12,931	7,108	108	1,318
1998-2011	-	-	1,182	5,823	12,931	7,108	108	5,818
2012	4,500 3/	-	1,182	5,823	12,931	7,108	108	1,318
2013-2029	-	-	1,182	5,823	12,931	7,108	108	5,818

Economic Rate of Return = 18%

1/ From Table 25.

2/ Done by farmers at an estimated financial cost of W2 million/ha (converted by using a factor 0.64) into border prices.

3/ Replacement cost of pumps, which would occur twice during the 50 year project life, were obtained by inflating the figures in ADC's completion data.

4/ Without project production foregone on land acquired for right of way (200 ha)

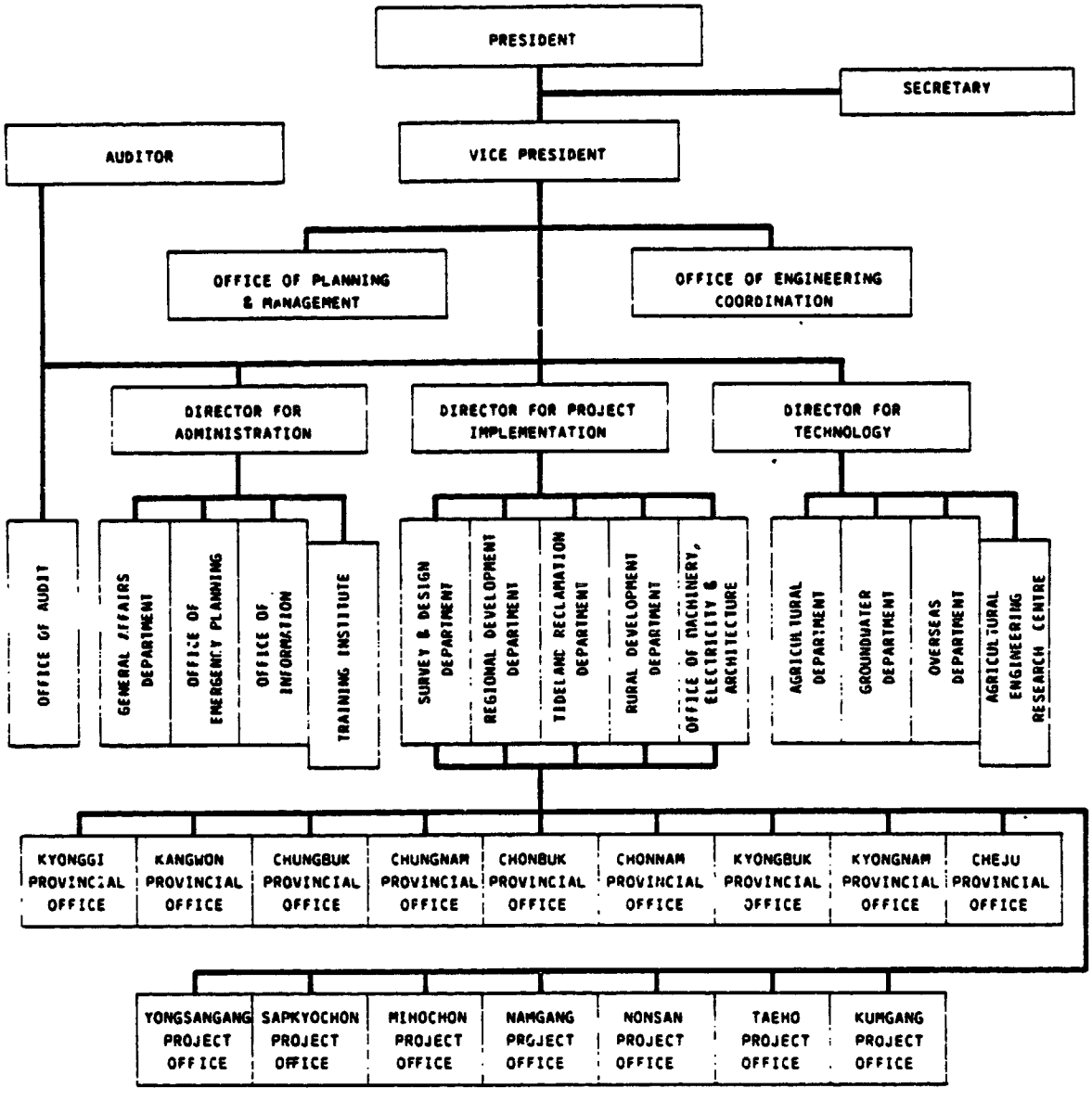
Table 28

Chart

KOREA

OGSEO AREA DEVELOPMENT PROJET STAGE I

CURRENT ORGANIZATION OF THE AGRICULTURAL DEVELOPMENT CORPORATION

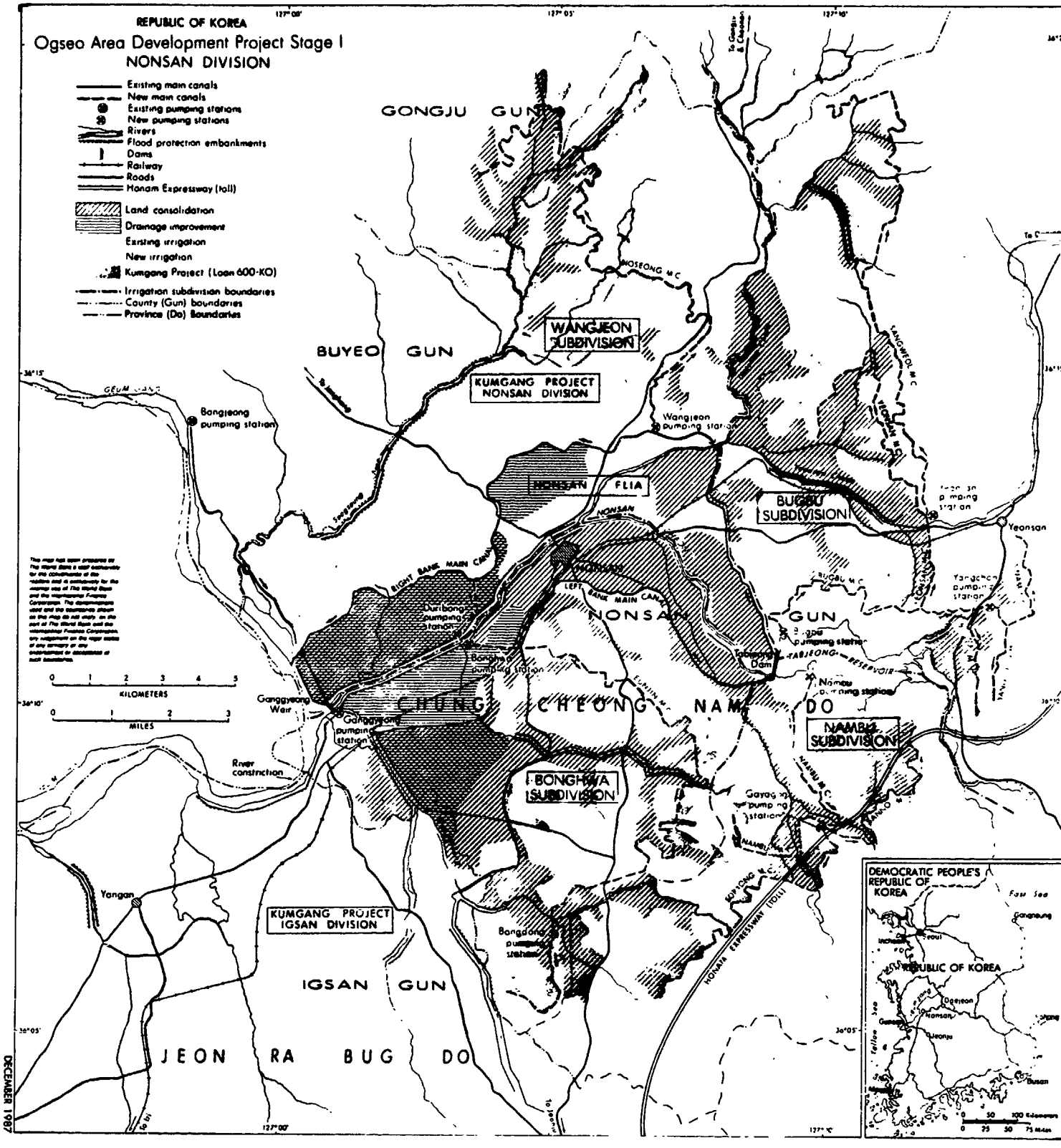


MANNED BY

IRRIGATION ENGINEER	:	1,023	PEDOLOGIST	:	26
MECHANICAL ENGINEER	:	33	GEOLOGIST & HYDROGEOLOGIST	:	111
ELECTRICAL ENGINEER	:	29	ADMINISTRATOR	:	336
ARCHITECTURAL ENGINEER	:	10	OTHERS	:	196
ECONOMIST	:	20			
AGRONOMIST	:	53	TOTAL	:	1,836

Professional Engineers

IRRIGATION AND DRAINAGE	: 38
SOIL MECHANICS & FOUNDATION ENGINEERING	: 2
CONSTRUCTION	: 8
APPLIED INDUSTRY & OTHERS	: 5
TOTAL	: 53


REPUBLIC OF KOREA
Ogseo Area Development Project Stage I
NONSAN DIVISION
Existing main canals
New main canals
Existing pumping stations
New pumping stations
Rivers
Flood protection embankments
Dams
Railway
Roads
Honam Expressway (toll)
Land consolidation
Drainage improvement
Existing irrigation
New irrigation
Kumgang Project (Loan 600-KO)
Irrigation subdivision boundaries
County (Gun) boundaries
Province (Do) Boundaries
GONGJU GUN
BUYEO GUN
WANGJEON SUBDIVISION
KUMGANG PROJECT NONSAN DIVISION
Bangjeong pumping station
Wangjeon pumping station
NONSAN FLIA
BUGBU SUBDIVISION
Yeonsan
RIGHT BANK MAIN CANAL
LEFT BANK MAIN CANAL
Duribong pumping station
Bonghwa pumping station
NONSAN GUN
Tabjeong Dam
TABJEONG RESERVOIR
Nonsan pumping station
Ganggyeong Weir
Ganggyeong pumping station
CHUNG CHEONG NAM DO
NAMBU SUBDIVISION
River construction
BONGHWA SUBDIVISION
Gayag pumping station
Yangan
KUMGANG PROJECT IGSAN DIVISION
Bangdong pumping station
IGSAN GUN
JEON RA BUG DO
HONAM EXPRESSWAY (TOLL)
KILOMETERS
MILES
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
REPUBLIC OF KOREA
Busan
DECEMBER 1987